# **MACHINE TOOL**

ment. Precision that assures accuracy. Investi-gate this Cost Reducer for second operation or initial machining of small finely-made parts from stainless steel, brass, plastic or other materials.

RIVETT 918 Plain Cabinet Turret Lathe

COST Reducer



RIVETT LATHE & GRINDER, Inc.

BOSTON . MASS. . U. S. A. BRIGHTON



Steels just don't come too tough for MARVEL Giant Hydraulic Hack Saws. Take, for example, the three No. 18 MARVEL Saws. to the Babcock & Wilcox steel mill, shown above, These machines are used to cut test specimens for sample pieces of stainless and other tough alloy billets which are checked for seams, pipes, etc., before being drawn into tubing. It takes tough steel to make the best tubing, and it takes modern sawing equipment to cut it rapidly, accurately and economically.

With 10 types of metal-cutting saws, each available in a series of variations, MARVEL can furnish sawing machines that exactly meet your requirements. If you have a metal-sawing problem-call in the local MARVEL Sawing Engineer,

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- 1. Remote Control
- 2. 1000 Combinations
- 3. Cooler Operation



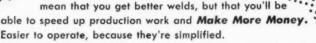
Hobart Electric Shalt Extension



Generator



HOBART Simplified are welders

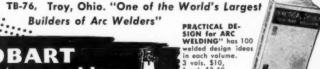


Remote Control allows the operator to change welding heat at the work, eliminating needless return trips to the welderspeeds up work. The 1000 Combinations encourage the operator to use the exact welding heat for every job and metal - producing perfect welds faster. You get Cooler Operation because the Hobart welder has end-to-center ventilation, which cools the welder twice as fast as conventional welders. Cooler operation means longer life. Use coupon for details. The Hobart Brothers Co.,

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Send for Bulletin 1020-7D8

The Sentry Company States

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The ARMSTRONG Gang Planer Tool not only ends costly delays for "tooling-up," it actually reduces planing time as much as 75%—multiplying machining profits proportionally. It is the correct tool for planing large surfaces. Carrying 4 square cutter bits, this tool makes not one but four cuts with each traverse of the bed. The head of this tool swivels and is graduated so that it can be quickly and accurately set to any desired feed.

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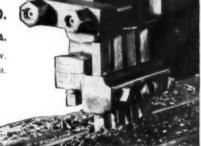
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## Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

#### Published Monthly

Volume 42, No. 7

#### **IULY 1946**

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Arrow A shows flow of lubricant around helical groove to point of center. The work turning in same direction also draws the lubricant into point by capillary action,

#### The Exclusive Helical Groove Carries the Oil to the Extreme Point of the Center

The extreme point of these centers and the entire bearing surface are always covered with a protective film of oil because the exclusive CMD helical groove conveys oil constantly to the point. Lubricant is never crushed or squeezed out. Center lasts longer. Work stays cooler. Send for descriptive circular now.

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Probably a Jones & Lamson Optical Comparator could effect comparable savings for you. Write for our book, "Beyond a Shadow of a Doubt." Or, better still, ask for one of our inspection angineers to call and discuss your inspection problems.



Small screws and threaded rods scarcely thicker than a hair, small musical instrument parts and peculiarly shaped tools that form the curves of cup mouthpieces are inspected on Jones & Lamson Optical Comparators.

This method of inspection enables the manufacturer to control the precision and high quality of these musical instruments at the source—rapidly and economically.

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MACHINE COMPANY Springfield, Vermont, U.S.A.



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This versatile cutter and tool grinder not only sharpens cutters, it grinds them from the solid, quickly preparing special cutters when needed.

¶ The CINCINNATI Monoset is so flexible that all operations necessary in the grinding or making of many types of cutters can usually be accomplished with one chucking of the workpiece. Thus you are assured of excellent concentricity; all teeth are exactly alike and will carry an equal share of the cutting load. Here are some of the features that make the CINCINNATI Monoset extremely versatile and flexible: a) Infinitely variable spiral leads. b) Workhead swivel mount for generating accurate radii. c) Micrometer dials and stops for all slides. d) Simple, accurate indexing devices. e) Wheelhead adjustable in three planes. f) Workhead motor drive for cylindrical grinding. Further details about these features, together with engineering specifications, may be obtained by writing for catalog M-1386-1.



Examples of cutters which are easily ground on the CINCINNATI Monoset Cutter and Tool Grinder — many of them from the solid, and at one chucking.



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CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES . BROACHING MACHINES . CUTTER SHARPENING MACHINES

### LEAD SCREW TAPPING...

ON YOUR OWN DRILL PRESS!



Precision ground lead screw provides accu-rate, controlled tap-ping from 0-80 to %".

With this ROTOREX tapping head you can convert your drill press to a precision tapping machine in a matter of minutes, and consistently produce Class III threads. To change to drilling, simply swing the ROTOREX to one side.

Employing the same principle as expensive tapping machines, the ROTOREX uses a precision ground lead screw for positive, automatic control of tapping leads and operates on a complete automatic cycle. It is rugged in construction, economical and can be operated with unskilled labor.

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- 1. Positive, automatic control of lead.
- 2. Hardened, precision ground lead screws.
- 3. Instantaneous emergency reverse.
- 4. Complete automatic cycle.
- 5. Accurate control of depth-accuracy to .010.
- 6. Foot control frees operator's hand for loading:
- 7. Capacity 0-80 to %".
- 8. Price complete, \$175.00, F. O. B. factory.

\$17500

MACHINERY CO., INC.,

146 BROADWAY, NEW YORK 7, N. Y.



# ONE FINGER is all it takes

# to start, stop, or reverse the spindle ... and this is a 50 h. p. headstock!

Yes, it's as easy as this with Gisholt's new Hydraulic Spindle Control. Just touch this handy lever...hydraulic power engages and disengages the forward and reverse multiple disc clutches. When the control lever is in neutral, pressure is directed to a contracting bandtype brake which brings the spindle to a quick, smooth stop. Thus, headstock control is effortless—as easy as pushing buttons!

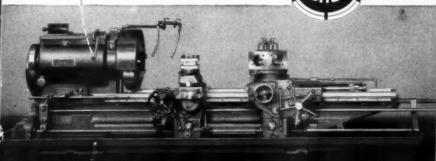
The Gisholt 5L Saddle Type Turret Lathe shown below is an extremely powerful machine with a 50 h.p. headstock. Yet it requires surprisingly light operating

Look Ahead . . . Keep Ahead . . . with Gisholt Improvements in Metal Turning effort. Another outstanding example of Gisholt leadership in faster, lower cost machining, the Gisholt hydraulic spindle control is now available on all Gisholt Turret Lathes. Write for complete information.

#### GISHOLT MACHINE COMPANY

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Welmore Reamer Company, Milwaukse.

#### An HD-1224 Electric Pot Furnace at the

#### ELECTRIC

TEBATING FURNACES SAECTRIC EXCLUSIVELY

nace for scale free hardening of alloy and tool steels, miscellaneous drawing operations and silver brazing. Write for Bulletin HD-635 - it details construction, uses and sizes of this furnace.



THE FELLOWS GEAR SHAPER



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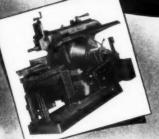




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Behind the scenes, men and machines work to keep the iron horse healthy.

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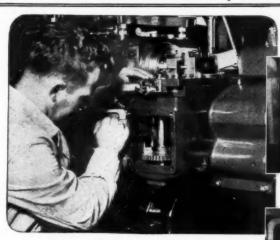
1 to 4 tons

Available with pedestal and with straightening or pull-

down attachment. Ask for Bulletin VJ-1.

# MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-owing PEOPLE" SENECA FALLS, NEW YOR



Class-up view of Simplified Change-Over Mechanism.



Close-up view of drum cam showing index line and graduated adjustment ring.

#### ALL So-swing AUTOMATIC LATHES PROVIDE FOR SIMPLE CHANGE-OVER FROM JOB TO JOB

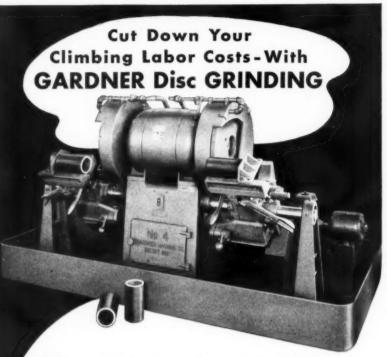
Production men appreciate the speed and simplicity with which all automatic Lo-swing Lathes can be changed-over from job to job. A hinged door on the Model "LR" provides easy access to the Simplified Change-Over Mechanism located on carriage front. Simply loosen two cap screws and move gear segment to graduation on scale corresponding to desired length of cut in inches. Tighten cap screws, and carriage is timed for the job at hand. Cam is standard and does not have to be changed, and since the cycle is closed and locked, machine cannot get out of time.

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All Lo-swing Automatic Lathes now have this Simplified Change-Over Mechanism as an inbuilt feature.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALL



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accurately, and with no more effort than is required to load and unload the sleeves. Oscillation of the work against the abrasive wheels is accomplished mechanically.

For example, it grinds both ends of hard cast-iron motor sleeves quickly,

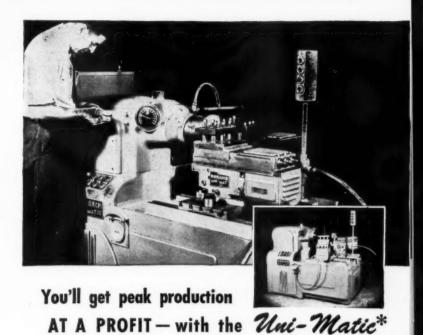
PRODUCTION: 60 per hour, complete on 2 ends (ground to a clean-up).

STOCK REMOVAL: Up to 1/8" per end.

GARDNER-GRIND YOUR Flat SURFACES WA

Write for additional data on GARDNER-GRINDING!

GARDNER MACHINE COMPANY
436 East Gardner Street \*\*\* \*\* Beluit, Wisconsin, U.S.A.



Spindle speeds up to 5000 RPM. Completely automatic cycle, electronically controlled. Independent-motor-driven interchangeable tool slides ("Uni-Mats") you can position universally, tool universally.

These are just a hint of some of the revolutionary features you'll find in the Uni-Matic... for chucking and fixture work as small as 1" and as large as 16" diameter. It's the machine that brings automatic production within reach of every shop, no matter how large or how small the lots.

You'll get minimum machining costs as only you can with specialized automatic production. Best of all, when you change your design you don't change Uni-Matics. Just tailor the tooling to fit your new operation—it's only a few hours' job. The Uni-Matic is universally adaptable.

\*UNI-MATIC — Add this new name to your metal-turning diction-ary—you'll be hearing a lot of it—wherever rising production costs are a factor. The Uni-Matic in Monarch's answer to this problem in the field of chucking and fixture work. For between-centers work it's the Mona-Matic; for hand screw machine work, the Speed-Matic.

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The Monarch Machine Tool Co. Sidney, Ohio







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The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your

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THE TANNEWITZ WORKS 4, MICHIGAN

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Formsprag is available in many sizes, providing torque load capacities from 20 to 10,250 foot pounds. Formsprag offers the highest possible capacities for size, weight and space required for installation.

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Upon request we will send you illustrated literature specification sheets showing capacities and diseasions of both plain and ball-bearing types. To serve you best, let us have a description of your operation, normal and maximum largue or specified speeds, number a times a minute the clarch engages and disengages space limitations and other perinsent information



# THE Springfield PRECISION LATHE

Tool Room Lathes are equipped with lead screw reversing mechanism, producing right and left hand threads and feeds. Has automatic stops for both lead screw and feed rod. Oil pan is also included as regular equipment. Bed constructed of High Test Nickel Chrome Gray Iron.

Gear box is tongued, grooved and bolted to front of bed and is the enclosed type to exclude dirt and chips from gears. Wide gears and heavy shafts with ball and bronzed bearings used throughout.

36 changes of threads and feeds are obtained, and in connection with the reverse gears, either right or left hand threads can be produced without the use of wrenches.

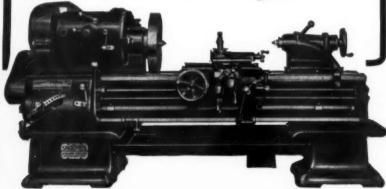
Massive tailstock, designed and constructed with long bearings on bed, is commensurate with the powerful headstock. All bearings and

ways are oiled from one well.

Regular equipment includes large and small face plates, tool posts, steady rests and all necessary wrenches. Motors are located in large cabinet leg under head stock connected to machine by either V belts or silent chain drive.

#### **BUILT TO GIVE** MAXIMUM VALUE





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SPRINGFIELD

OHIO, U.S.



# [Certifying the spacing of location pins on a fixture, with two with two combinations of Jo-Blocks.] When the Jo-Blocks say "it's right"—then it's RIGHT!

When you take a measurement with Jo-Blocks and the Jo-Blocks show the dimension is per specification . . . that's that! Genuine Johansson Gage Blocks are warranted accurate to within .000002", .000004" or .000008", ±. They are made in America by Ford Motor Company only. They are used by hundreds of manufacturers, as master gages to check working gages, micrometers, etc., as precision layout tools and frequently as actual working gages (since the cost of an individual Jo-Block or two is often appreciably less than that of a specially-built working gage).

If your plant—particularly your tool-room—is operating without the reassuring control of a set of genuine Ford Jo-Blocks and Accessories, it would be well to consider this very moderate investment. Ford Motor Company, Johansson Division, Dearborn, Michigan. Dept. 78.



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CANEDY - OTTO General Offices and Factory:

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- A general purpose production drill . . . identified as a 21" Sliding Head Motor Driven Floor Drill . . . and available with either a square oil grooved or round T-slotted type table.
- Showing a 21" Sliding Head Box Type Column Floor Drill . . . produced in single and multiple (2 to 6) spindle models. Built for accurate work . . . and for years of service.
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- Single Spindle Floor Drill which is also available in multiple spindles from 2 to 6 . . . and in bench models. Equipment is well designed and built for quality production.







Send for full details of the equipment which will best serve your purpose. Let us know your problem . . . A C-O analysis will be helpful to you. Write today.

MANUFACTURING CO.

# For ECONOMICAL FASTENING CALL Chicago Rivet!

Riveting with Chicago Automatic Rivet-Setters is a fast, inexpensive way to fasten metal to metal, wood to wood, leather to leather, fabric to fabric, plastic to plastic, or any combination of these. Chicago Rivet engineers have the experience of 26 years to help you with your hard fastening problems.

# Free FASTENING CLINIC

Send us a drawing or unfastened sample or sub-assembly of your product. We will gladly analyze your fastenipg needs, recommend the type of rivet and Chicago Automatic Rivet. Setter to do the job best, and submit estimated production rates. No obligation.

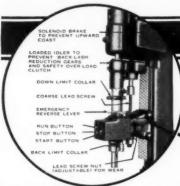


Chicago Automatic Rivet-Setter

#### CHICAGO RIVET'& MACHINE CO.

9610 W. Jackson Blvd., Bellwood, Ill. (Chicago Suburb)

Automatic Rivet-Setters  $\bullet$  Tubular and Split Rivets in all Rivet Metals  $_{\rm CR}$ 



FEATURE No. 3

#### THE avey TYPE MA-6 AVEY-MATIC POWER FEED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

features

reversing motor, positive lead screw tapping - for accurate thread and tapping in soft material or thin sheets

Dog control for depth - maintaining accuracy of depth within one-half revolution of the spindle or emergency relief lever used to reverse motor if necessary before tapping cycle is completed.

> Type MA-6 is made in following capacities: No. 2 - 1/8" capacity in cast iron. No. 3 - 11/4" capacity in cast iron.

> THE AVEY DRILLING MACHINE CO. CINCINNATI . OHIO . U. S. A.

THREE SPINDLE No. 2

TYPE MA-6 . COMBINATION MACHINE

1st Spindle - Avey-matic Feed

2nd Spindle - Hand Feed

3rd Spindle - Tapping (Reversing Motor)









#### NEW MULTI-PURPOSE FIXTURE

Typical set-up for grinding cutting chamiers on taps.

HERE'S a fixture that will save you the expense of buying special duty machines for such work as grinding cutting edges, steps, flutes and chip relief on milling cutters, burring tools, counterbores, countersinks, end mills, reamers, drills and taps.

All adjustments simple, visual and external. Instantly adjusted to right or left hand. Axial relief automatically equalized on all flutes. Can be used on surface grinders as well as cutter grinders. Performs most jobs with standard grinding wheels.

Send for literature explaining simplicity of operation and illustrating typical applications.

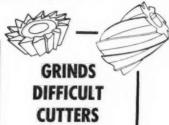


**GOVRO-NELSON CO.** 

1933 Antoinette Detroit 8, Mich.

# When Sharpened on the ACE Cutter Grinder

The problem of keeping cutters in good condition is easily solved by The Ace... though new in principle, "THE ACE" is old in experience, having proved its worth by cutting costs in hundreds of plants.



#### **OLIVER Instrument Co.**

**EASILY!** 

1408 E. MAUMEE ST. ADRIAN, MICH.

Don't Neglect Your Toolroom It's the Backbone of Production!



#### KEEP PRODUCTION GOING

We recommend it for grinding face mills up to 15" ... slitting saws ... mill ends ... angular cutters ... slab mills ... dovetail cutters ... reamers ... taper reamers ... gear cutters ... double angle cutters. Fellows helical cutters ... production gashing ... radial relief grinding ... and newer uses are found every day.

It is easy to operate . . . simple to set up . . . the ACE keeps the work before the eye with no bending . . . no squatting . . . no squinting . . . . saves the operator from work fatigue. Keeps production going

Send for Illustrated Literature, Now

Oliver

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

# GRENBU HYDRAULIC GRINDING MACHINES

#### **FEATURES**

- Infinitely Variable Longitudinal
- Hydraulic Cross Feed
- Coolant
- Precision Spindles
- Heads Swivel For Angle Work
- Grinding Heads To Convert For Internal Grinding (See Cut)

#### **EG103 SPECIFICATIONS**

rk Capacity—3" Dia. x 10" Length rkhead Accommodates—Collets 1" Max. Hole —Chucks & Face Plates 4" Max. or Space & Wt. 45" Long x 25 Wide—1600 lbs.

THE
PRENBY MANUFACTURING
COMPANY

LAINVILLE, CONNECTICUT





#### WHERE FIVE RUBBER CUSHIONS ASSURE SMOOTH OPERATION IN LOGAN LATHES

TWO RUBBER CUSHIONED BEARINGS, one at each end of the two hinge points connecting countershaft and headstack.

ONE RUBBER CUSHION between motor mounting base and pedestal.

TWO RUBBER BUTTONS cushion the cone pulley guard.

#### ABSORBS VIBRATION, GIVES LOGAN LATHES MAXIMUM SMOOTHNESS AND ACCURACY IN OPERATION

Rubber cushioning of the countershaft is one of the unique design features which help make Logan Lathes outstanding in smooth, accurate operation. At no point on the Logan Lathe is there a direct metal-to-metal contact between countershaft and headstock. At all three of the countershaft's main support points, the pedestal rod and the two hinge pins, rubber cushions effectively absorb motor vibration. The result is a maximum of smoothness in operation that is conducive to fine precision work. For details on all the Logan advanced design features, see your nearby Logan Lathe dealer, or write direct for Logan Lathe catalog.



**Quick Change** Gear Turret Lathe

SPECIFICATIONS COMMON TO ALL LOGAN LATHES . . . swing over bed, 101/2" . . . bed length, 431/2" . . . size of hole through spindle, 25/32" . . . spindle nose diameter and threads per inch, 11/2"-8 . . . 12 spindle speeds, 30 to 1450 rpm . . . motor, 1/2 hp. 1750 rpm . . . ball bearing spindle mounting . . . drum type reversing motor switch and cord . . . precision ground ways, 2 V-ways and 2 flat ways.

# Me NORTON 4" Type C... A PRECISION MACHINE Designed for Grinding Small Work.



- Flectronically-costalled variable work speed drive over a
   vice range.
- Compact controls and edjustments conveniently located fur maximum operating convenience.
- Time-wasting hand motions eliminated by interrelated automatic controls.
- Hydraulic table traverse hydraulic power rapid traverse of wheel slide two-speed hand table traverse grinding wheel resinguration.

The Norton 4" Type is a grinder that can turn out small cylindrical work to extremely high accuracy standards at an extremely high production rate. A new catalog — Form 287 — eines complete details.

#### NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities

m. 570

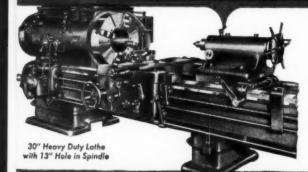


NORTON GRINDERS

POIT Beffer.

## **Hydratrol Lathe!**

LARGE HOLLOW SPINDLE TYPE



5 sizes-18" to 36"

Small, 18" up to 7-1/8" Hole Medium, 24" up to 12-1/8" Hole Large, 27" up to 13-1/8" Hole Large, 30" up to 14-1/8" Hole Large, 36" up to 14-1/2" Hole

(Standard Type)

DO IT FASTER

\* DO IT MORE EASILY

\* DO IT MORE ACCURATELY

\* DO IT MORE ECONOMICALLY

\* DO IT MORE ECONOMICALLY



Standard Type, Heavy Duty HYDRATROL LATHES, 20" to 36"

The big 27" size, shown above, has all the ruggedness and power for the heaviest possible work. And its many refinements in design and construction result in an ease of operation comparable to small machines.

Precision - Speed - Endurance Long Life-Missaco et Mechanical Temples

ehmann

MACHINE COMPANY

CHOUTEAU AT GRAND - ST LOUIS 3 MO

# Because They're PRECISION BUILT!

ulti-Purpose SHAP

LLUSTRATED here is only one of many dependable and efficient machine tools that contribute to the high degree of accuracy, and easy, quiet, smooth-running operation so characteristic of GEMCO Shapers.

Precision grinding is employed on all GEMCO ram ways and vertical guides of the column, the ram, ram gibs, the tool head body, tool head slide and clapper box, the crossrail, all table surfaces and table support rail, the vise base, vise body and hardened jaws, crank block, crank plate and the "Lubrigard" housing.

Time-tested GEMCO features are: Exclusive "Lubrigard" Safety Device which increases the precision life—Centralized controls save time and effort, increase production—Large easy-to-read dials—Wide range of feeds and speeds. GEMCO Shapers save time, cut costs, produce better work!

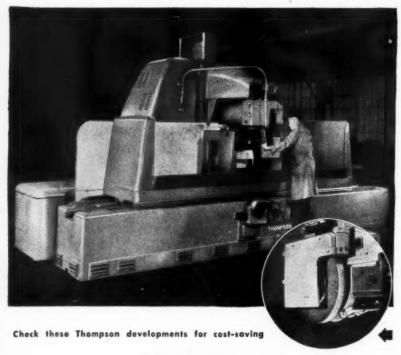
Write Today for BULLETIN GC-128

QUALITY MACHINES

PRODUCE

QUALITY MACHINES!

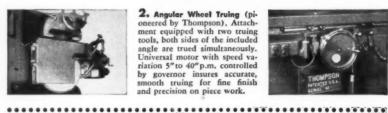
GENERAL ENGINEERING & MFG. CO. ST. LOUIS 4. MISSOURI Manufacture of PRECISION MACHINERY Since 1917



1. Automatic Wheel Truing (pioneered by Thompson). The stationary truer provides instant availability of the truing tool and all wheel head slides are now equipped with hydraulic wheel truing feeds. It is not necessary to disturb the work piece in order to true the wheel.



3. Automatic Down Feed (exclusive Thompson feature). Feed cycle of .00025" to .004" is available at each table reversal for plunge cutting or at each wheel head feed reversal. Feed mechanism has automatic trip-can be pre-set for size control from elevating hand wheel graduations, duplicating accuracy to .0002"



2. Angular Wheel Truing (pioneered by Thompson), Attachment equipped with two truing tools, both sides of the included angle are trued simultaneously. Universal motor with speed variation 5" to 40" p.m. controlled by governor insures accurate, smooth truing for fine finish and precision on piece work.



#### Before you buy

## investigate!

These 8 Thompson Developments Offer More Exclusive Features to Help Reduce Grinding Costs

You will find most of the important costsaving developments in surface grinders on Thompson machines because Thompson has been a successful pioneer in this field. All eight of the outstanding improvements described here have been pioneered by Thompson . . . and six of them are exclusively Thompson features.

Check the Thompson line first In addition to a complete line of hydraulic surface grinders from 6" x 18" to 36" x 240", Thompson offers Broach Grinding

Type C Grinder (36" x 36" x 96") shown grinding ways of machine bed. Both flat and "vee" type wheels are mounted on wheel head spindle.

......

Machines . . . fully automatic and hand feed types for round or flat broaches . . . and the famous new *Thompson Truforming Grinders*, completely engineered units with *two* crushing rolls permitting practical production of precision flat form contours for the first time. Write for details.

Address Dept. 14
THE THOMPSON GRINDER COMPANY, INC.
SPRINGFIELD, OHIO

## Thompson SURFACE Grinders



4. Automatic Sparkout Control (exclusive Thompson feature). Allows table and wheel head to continue finishing cuts after automatic down feed device has reached pre-determined size. At fixed time after work size is reached, table rapid traverses to loading position and stops automatically. Usually furnished in conjunction with automatic

down feed. This device maintains accurate duplication of dimensions and makes possible battery installations by releasing operator for loading other machines.

5. Flame Hardened Bearings (exclusive Thompson feature). Wheel head slide ways are flame hardened and precision ground for bermanent accuracy.

6. Pressure Lubricated Spindles (exclusive Thompson feature). Direct-powered wheel-head spindle of heat-treated alloy steel in silver-lined bearings is permanently vibration-free. Positive automatic pressure lubrication is provided by pump inter-locked with spindle motor.

7. Anti-Friction Elevating Unit (exclusive Thompson feature). Friction between screw and nut is reduced 70% to permit accurate feeding to .0001". Also minimizes effort of moving saddle assembly when making new setups without power elevation. Permits inexperienced operators to finish work by following handwheel graduations.

8. Double-Length Bed (exclusive Thompson feature). Massive double-length solid-cast beds are provided with heavy cross-section and numerous ribs at vital points to provide absolute rigidity for table.

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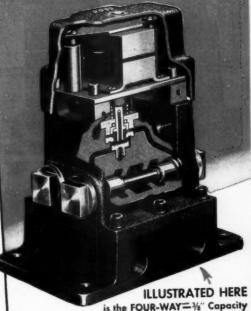
#### The air Valve You Have Been Looking For PILOT OPERATED - SOLENOID CONTROLLED

A New ROSS Piston Poppet Type Valves

- FAST OPERATING as high as 400 cycles per minute.
- LARGE ORIFICE AREA results in fast exhaust, minimum restriction to air flow.
- POSITIVE SEAL by line pressure.
- SIMPLICITY OF DESIGN removing end plugs permits replacement of piston poppet assembly - no need to disturb piping or to move valve from position-no "down time".
  - **ECONOMICAL TO OPERATE** current consumption 1.2 amps. at 110 volts-60 cycle.
  - LONG SERVICE ASSURED many Ross valves installed more than 20 years ago are still in active service.
  - SMALL AND COMPACT appreciated where space is limited.
  - ALL PARTS non-corrosive metals.
  - ACCURATELY MACHINED and all parts interchangeable.

A TYPE AND SIZE FOR EVERY PURPOSE

OVER 100 DIFFERENT MODELS



Available in:-

- THREE-WAY normally open, or normally closed
  - FOUR-WAY and
  - FOUR-WAY, Five port. may be had in ¼", ¾", ½" and ¼" pipe size

ROSS Operating VALVE CO.
6480 Epworth Blvd. Detroit 10, Mich.

RIDLE FOR AIR HORSEPOWER



THIS combination of matched units serves convenience and rigidity for accurately locating and chucking work when boring, milling, planing or for other teolroom and general use. They can be used singly or in variety of combinations for large or small work.

They are machined from box section castings, with Tee slots and flat surfaces in precise alignment.

They are made with the same tooling and quality as the JIGMIL table.

Each set includes Tee slot nuts, studs and screws.

Write for price and delivery!



DevLIEG MACHINE COMPANY



TEG 450 FAIR AVE. FERNDALE 20,

## Saw More METAL CUTTING MACHINES

GUARANTEES THESE OUTSTAND. ING FEATURES

 Machine
 Size
 10"x10"
 6"x6"

 Capacity-Straight
 Cutting
 10"x10"
 6"x6"

 Capacity-Straight
 Cutting
 10"x 6"
 6"x8"

 Blade
 Stroke
 6"
 6"

 Blade
 Length
 33
 120
 149 S.P. M.
 65. 93.

 Speeds
 .65
 33
 120
 149 S.P. M.
 65. 93.
 120
 149 S.P. M.
 68. 92. P.M.

 Height
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Height of Table 22" 120, 149 S.P.M.
Height Over All. 66" 23" 3" 3" 3" 120, 149 S.P.M.
Floor Space 56" 2 H.P.
Size and Speed of Motor. 2 H.P.
Weight 1750 r.n.m. 1750 r.n.m.
Shipping Weight 2010 Lbs 1653 Lbs.

MAQUOKETA COMPANY

MAQUOKETA, IOWA

## ONE for TWO jobs



benchmaster OFFERS A
LOW-PRICED BENCH MACHINE
FOR BOTH HORIZONTAL
AND VERTICAL MILLING

benchmaster mill with horizontal spindle overarm

#### SAVES VALUABLE SPACE-CUTS DOWN EQUIPMENT COSTS

Now you can obtain a precision perfect, high-speed benchmaster milling machine that's easily convertible from a horizontal to a vertical miller by simply interchanging spindle attachments. Its unusual versatility, plus the usual quality-plus benchmaster workmanship, make this double-duty milling machine an outstanding addition to your shop.

SPECIFICATIONS: Table size -6"x 14"—Three Tee Slots  $\frac{3}{8}$ ", 2" center Longitudinal travel  $8\frac{1}{2}$ "—Traverse travel  $5\frac{1}{2}$ "—Vertical travel  $8\frac{1}{2}$ " on vertical mill— $9\frac{1}{2}$ " horizontal mill—Height 28"—Weight (less motor) 215 lbs.—Requires  $\frac{1}{2}$ 3 h.p. motor—Spindle speeds (standard 1725 rpm motor) 450-850-1400-2100 rpm.



MANUFACTURING COMPANY



# ENGINEERING VISION THAT MEETS THE NEEDS OF OUR SONS...NOT OUR GRANDFATHERS X. R. Wilson

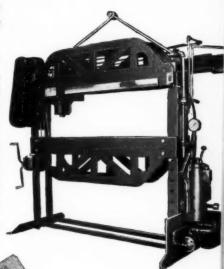
Specifications

#### OF BENDING, STRAIGHTENING AND FORMING PRESS ILLUSTRATED

| Opening between Upright Members 72' |
|-------------------------------------|
| Maximum Daylight35                  |
| Minimum Daylight4                   |
| Cylinder Travel Laterally48'        |
| Ram Speed Laterally90"/min          |
| Ram Travel                          |
| Ram Speed Horizontally 15"/min.     |
| Overall Height100"                  |
| Overall Width108"                   |
| Wainha 37004                        |

## NEW KRW SHEET STRAIGHTENING PRESS SAVES MAN POWER...HIGHLY FLEXIBLE...DELIVERS ONE TON OR A HUNDRED WITH THE ...Plip of a Finger

· History books tell about the past. Business... successful business... is built by looking into, and anticipating the needs of the Future. In designing, engineering and manufacturing, KRW builds with tomorrow's needs in mind. That's our idea of Vision. The best proof of practical application can be found in the innumerable adaptations of the basic KRW Hydraulic Arbor Press which have been supplied to industry. The one illustrated on the opposite page is a typical example of KRW engineering vision. Here it has become a high-speed straightening press . . . supplanting a costlier, labor-consuming method formerly used. Other KRW contributions to low-cost production include Forming Presses . . . Stretcher Levellers . . . Forming Brakes . . . Improved Hydraulic Arbor Presses . . . all adaptable to either hand operation, Air-Oil operation or Electric motor operation. They are built to furnish tonnage pressures ranging from 25 to 200-tons. Their cost is surprisingly low in comparison with other suitable types of conventional equipment. The new KRW catalog gives dramatic proof of KRW en-



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Marveco Live Center—designed and constructed for long wear and unusual capacity. Auto-matic takeup compensates for wear quaranteeing Long Life Accuracy.

Send us your CENTER PROBLEMS

THE LIVE CENTER



WITH A GUARANTEE

Send today for Free Catalog "THE MARVELS OF MARVECO"

MARVEL TOOL & MACHINE COMPANY

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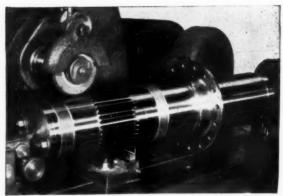
Here's something entirely new in open-type general-purpose motors ... incorporating new design practices, improved materials and manufacturing methods developed through General Motors' varied resources.

Take a look first at the rugged frame. It has been redesigned to provide complete top-half enclosure that protects the interior from dripping liquids, falling chips, dropping particles. And inside you'll find other great new features: shielded and sealed type ball bearings, preventing grease leakage into windings—fewer parts requiring service—new improved ventilation and insulation. In fact, everything about this compact and sturdy motor points to peak performance, minimum maintenance and maximum life!

The new Delco general-purpose ball-bearing motor is available to meet the torque and starting requirements of almost unlimited industrial applications. Write today for complete engineering data and delivery schedules.

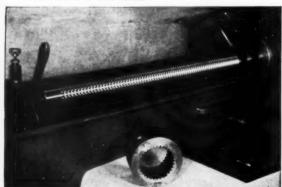


# Spline Grinding Aircraft Propeller Shaft



#### In the Spotlight"

SPLINE BROACHES UP TO 84 INCHES LONG. Complete Broach Tooling and Engineering Service . . . GAGES, Serration or Spline, male or female . . . Master Gears and Gear Racks . . . Master Index Plates . . . Splined Arbors for gear-grinding . . . Hobbing, Shaving and Checking . . . Production Broaching and Machining. Available from stock, Radius Gages for checking form and hook on broach tooth forms.



Involute
Spline
Broach and
part of
Wrench
being
Broached for
Aircraft
Engine
Crankshaft.

GREAT LAKES POPULAR STREET DETROIT T, MICHIGAN

## One of the TOUGH JOBS you'll see licked at a SKILTOOL CLINIC



• In view of the ever-increasing necessity of stepping up production at lower cost per hour... you owe it to yourself to find out the newest ways to cut costs with faster-working SKILTOOLS. Grinding welds on stainless steel is only one of countless operations that SKILTOOLS do better, faster and easier. Let your superintendents, engineers and foremen see just how.

aster and easier. Let your superintendents, engineers and foremen see just how the complete
SKILTOOL Line can improve your production
methods . . how it speeds up your own specific
jobs. Your distributor and a specially trained
SKILTOOL Engineer will gladly conduct a costcutting SKILTOOL CLINIC in your plant. You'll
find that it's a very wise investment of time.

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ON STAINLESS STEEL WITH MODEL "G" SKILSANDER

### CUSTOM BUILT AIR CYLINDERS



FENN Custom-Built Air Cylinders eliminate completely the necessity of fitting your designs to standard type cylinders, particularly where space is at a premium. By adopting Fenn Cylinders you may reduce your space requirements for the same power at the same available pressure because Fenn builds them specially to meet the requisites of your designs.

Complete cylinder valve can be furnished as a separate item or as an integral part of the cylinder.

Built to provide accurate control of the piston velocity curve according to your needs, all Fenn Cylinders can be cushioned at either or both ends of the stroke.

Orders accepted in any quantity. Prices only a fraction more than standard cylinders. Inquiries invited regarding your specific problems.

## The **FENN** Manufacturing, Company

HARTFORD . CONNECTICUT Dept. G



#### **20% LOWER COSTS**

This gray iron foundry was using a small wheel grinder weighing 2¼ lbs.—17,000 R.P.M., 1¼" x 3" x 1½" elastic bonded cone wheel—to clean recesses in exhaust manifolds. They called in the Rotor Application Engineer to suggest a faster method. He recommended the Rotor M-827 midget grinder—weighing only 1½ lbs.—20,000 R.P.M.—same wheel as before. The change was made. Results:

Grinding costs reduced 20% because of greater production due to:

1. Higher cutting speed of wheel on work

2. Easier bandling of tool (60% lighter). Easier to reach hard-to-get-at spots,

Also: Operators were happier because work was easier.

Why not ask the Rotor Application Engineer to analyze your portable tool operations and see if he can discover similar ways to reduce your grinding costs?

Yours for faster grinding,

AIR O'TOOL

THE ROTOR TOOL CO

CLEVELAND, OHIO



INBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



## These ADVANTAGES for Miniature Airplane Engines



- 1. Long Service Life
- 2. Easy Starting
- 3. Guaranteed Interchangeability of Parts
- 4. Extremely High Efficiency

The Sunnen Precision Honing Machine assures longer life, smoother operation, and closer fits on all bearing surfaces from .125" to 2.625" in diameter. Accuracy guaranteed within .0001" with super-smooth finish. Can be used in all metals, plastics, ceramics, glass, etc. Accurately duplicates sizes. Requires no skilled labor. Can be set up in one minute. Economical to operate.

Call in a Sunnen engineer — or write for complete information.

SUNNER SUNNEN PRODUCTS CO.

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#### - Typical Jobs -



Cast fron Valve Stem Guide. 1/2 to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."



Automobile Distributor Shaft Gears, Taper removed at a rate of 80-90 per hour,



Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.



Compressor Yoke. Alignment maintained and better finish produced.

## S-A-Hol-Down Clamp Secures Work Pieces in Record Time!

Speed reconversion tooling. Set up your shop in absolute minimum time. With S-A-Hol-Down Clamp you lower production costs, get flexibility with greater speed.

Eliminate the old bolt and bar method. The S-A-Hol-Down Clamp can solve any problem around the drill press. Get 8,000 lbs. per square inch of equalized pressure with this compound leverage. Holds firm under fast drilling without turning or shifting. Practical for either precision or production work.

Order direct today. \$2450 f. o. b. Cordele, Ga.

Trade Mark Reg. Patent Pending

HARRIS FOUNDRY

MACHINE CO.

July, 1946

MACHINE TOOL BLUE BOOK

49

## for top speed work in tough die steels

Do your cutting in tough die Do your cutting in tough die steels—at bigh speed—with T-J Die Sinking Milling Cutters! De-signed and built right for sturdi-ness... ability to hold a sharp edge longer...and carry less betakage percentage. More work between grinds! Made from a standard, extremely high grade steel...better performance because of extra strength, wear resistance and uniformity. Backed by 29 years of T-J ex-perience. Write for catalog. The Tomkins - Johnson Company,

FOR TOUGH JOBS SPECIFY



TOMKINS-JOHNSON

Jackson, Michigan.

DIE SINKING MILLING CUTTERS



#### The Facts of the case

This Cromovan Die and Punch is blanking 100,000 to 120,000 pieces of .025" silicon steel per grind . . . The original height of the die was 11/4 inches . . . now 5/8 inches high and still going, after having produced 4,500,000 pieces! For long service on high production iobs—use Cromovan Steel Dies.



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#### The Finest Line of WELDED STEEL PRESSES

Weldments
Fully Stress-Relieved

## ECCENTRIC GEAR PRESSES HYDRAULIC PRESSES PRESS BRAKES

#### Don't Let Delayed Delivery Hold You UP

Our large production facilities place us in a better position than many others to give you prompt press delivery.

Warco welded steel presses are the most modern available —engineered to provide greater rigidity, accuracy, strength, power and endurance.



#### OBI PRESSES

Capacity range, 50 to 200 tons, stroke range, 4 to 14 inches, single geared, electrically controlled, latest type friction clutch and brake unit.

Your inquiry will receive immediate attention. We also invite you to pay a visit to our plant, the largest of its kind in the world.

#### WARREN CITY MANUFACTURING COMPANY 1948 GRISWOLD STREET, WARREN, OHIO

A Subsidiary of The Federal Machine and Welder Company
Offices in Principal Cities



#### DEPENDABLE MEASURING and CHECKING EQUIPMENT

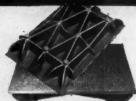


#### SLOTTED ANGLES

In 19 sizes, ranging from 4 x 9 x 5 and up—in both scraped and ground finish.



Over 50 sizes, ranging from 7 x 716 to 96 x 192.





#### UNIVERSAL ANGLES

In 10 sizes, ranging from 4 x 334 x 5 and up-in ground finish. Special sizes made to order.



#### BOX PARALLELS

In 15 sizes, ranging from 3 x 4 x 12 and up-in ground finish.

Also, measuring angles, angle plates, vee blocks, straight edges, boring mill parallels, steel parallels, cylinder squares.

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## Ready for Delivery STANDARD CAST IRON HAND KNOBS









STRAIGHT and OFFSET TYPE HAND WHEELS





MACHINE HANDLES

SOUD

ROTARY

MALLEABLE IRON LEVERS



MACHINE PRODUCTS CORPORATION

6773 E. McNichols Road

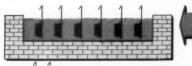
Detroit 12, Mich.

## HOW TO HEAT TREAT A WADGET\* AT LOWEST COST



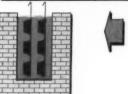
To protect the surface, avoid distortion, eliminate decarburization, a salt bath furnace will, of course, be used.





If you get a conventional salt bath furnace it looks somewhat like this . . . and the Wadgets are placed like this.

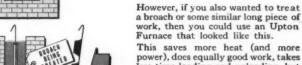
Note the surface area exposed.†



If you have an *Upton* Electric Salt Bath Furnace it would probably look like this . . . with the Wadgets being placed like this.

Note surface area exposed.





ZTBROAW

WAITING TO BE TREATED not saves more neat (and more power), does equally good work, takes less time loading and unloading, but some people think it won't work; that it's too deep. So, until they do realize that Upton Furnaces can be built to take any length work, the other furnace (No. 2) is usually supplied.

\* Wadget: A piece of work that you are wondering how to treat for better results and at lower cost than at present which will eventually be heat treated in an Upton Electric Salt Bath Furnace because there is no known size or shape that cannot conceivably be treated in an Upton Electric Salt Bath Furnace.

Why don't you send for more information on Upton Furnaces? Send us the dimensions of your Wadgets.





### For High Production

HY-PRO precision taps produce consistently more threaded pieces to lower your tapping costs. Their extra hardness and durability result in longer life, greater accuracy, more wear between sharpenings.

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Tapping Problems.

Our Engineering Staff will give them careful study and recommend the best solution.



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New Bedford, Massachusetts, U.S.A.

## ENGINEERED

Live Centers

Standard shanks with Morse tapers carried in stock, send us your specifications and blueprints \_ \_ we will see that your job is set up with the right LIVE CENTER.

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LARGE THRUST BEARING

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Boring Bars and Tools

Broaches Broach Pullers Broaching Fixtures

Core Drills

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Counterbores (Teol Room Sets)

Counterbore

Inserted Blade Cutters Carbide Tipped

Coffers Form Relieved

Cutters

Milling Cutters Throad Milling

Cutters

End Mills

Side Mills High Speed Steel

Reamers Carbide Tipped

Resmers Shell Reamers

Inverted . Spotfacers

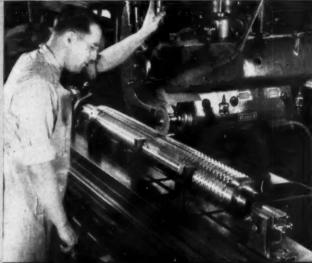
High Speed Steel Tool Bits

Carbide Tipped Tool Bits

Circular Form Tools

Cut-off Tools Flat Form Tools

Dovetail Form Tools



#### CONTINENTAL BROACHES

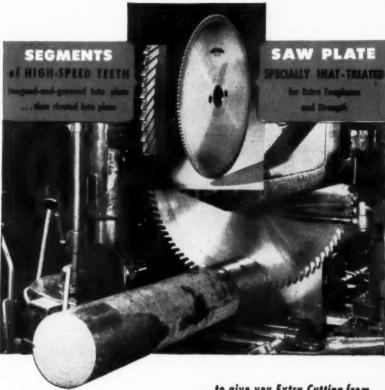
Precision Ground by Experts

The 26 years experience of Continental engineers assures you that each broach is exactly fitted, in design and workmanship, for the job it is intended to do. Each is ground to exceptionally close tolerances by a skilled broachmaker. Continental makes a complete range of internal and external (surface) broaches, fixtures, holders and pullers, fall to the same high standards. Call Continental today.



CONTINENTAL TOOL WORKS

DETROIT 6, MICHIGAN



This fine-tooth saw delivers maximum cuttinglife on work requiring a fine pitch or specially smooth cut. Double-lap construction, with teethsegments secured and aligned in place by 5 rivets, gives greatest tension and torsion strength... and makes the saw run true, uithout sibration or chatter, under the highest cutting pressure. Special tooth-design channels the coolant right to the cutting edge, so that dulling from friction-heating is long deferred. And even when teeth do dull, the segments are quickly and easily replaced. Order Simonds Segmental Saws from your Industrial. Supply Distributor, or get in touch with the nearest Simonds office, listed at the right. ...to give you Extra Cutting from

#### SIMONDS

## SEGMENTAL Metal-Cutting Saws

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Maza, 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif., 311 S.W. First Avenue, Portland 4, Orc., 31 W. Trent Ave., Spokane 8, Washington. Conadian Festory: 199 St. Remi Se.,



FITCHBURG, MASS

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ILLINOIS . DISTRIBUTORS IN PRINCIPAL CITIES

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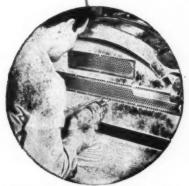
to Peak Production . . . Lower Cost



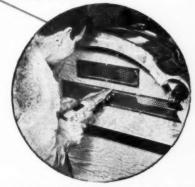
PORTABLE ELECTRIC TOOLS Smaller in size and lighter in weight for greater handling ease, Thor Electric Tools have high-efficiency motors that provide more power-per-pound than ever before.

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"FINGER-POINT" ACCURACY at 2500 r.p.m. with this 4," cap. Thor No. U14AP drill,



AUTOMATIC ADJUSTABLE CLUTCH - Ther U16CP Electric Screwdriver drives screws to exact tightness at top speed.



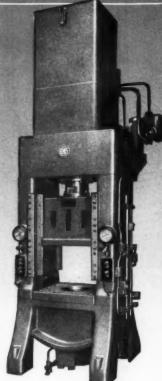
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#### for LONG RUNS ... because it's Fast!-

### SHORT RUNS ... because it's Flexible!



#### PRODUCTION-SHOP SPEED

This capable Elmes press for drawing, forming, bending, coining, puts job-shop sheet metal work on a production basis; gives production shops the flexibility to handle just about anything that comes along.

#### Features That Make It Fast

High-speed approach, pressing, and return of slide and cushion. Rapid reversal, speed change, and pressure generation. Ample stripping pressure. Large ejector capacity of cushion. Full push-button control.

#### Features That Make It Flexible

Adjustable stroke, speed, and pressure. Adjustable cushion stroke, pressure, and return timing. Automatic reversal and speed change at any selected slide position or pressure. Convenient adjustments. Full automatic "inching."

• Write today for all the facts about this press that "does everything" with the speed and ease you usually associate only with specialpurpose designs. Shown: 100-ton Model 6780.



ELMES ENGINEERING WORKS of AMERICAN STEEL FOUNDRIES . 244 H. Morgan St., Chicago 7, 111,

Also Manufactured in Canada

METAL-WORKING PRESSES - PLASTIC-MOLDING PRESSES - EXTRUSION PRESSES - PUMPS - ACCUMULATORS - VALVES - ACCESSORIES

LOSING MONEY EVERY DAY . ..

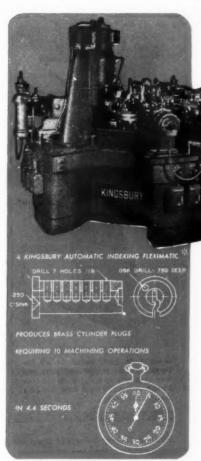


## IF YOU'RE NOT CASHING IN ON HOFFMAN FILTRATION BENEFITS

Don't pass up the increased production, finer precision finishing, longer life for cutting tools and grinding wheels, and the savings in maintenance that you can easily enjoy with Hoffman coolant filtration. Investigate the results you can expect, and ask us to estimate the savings possible for you.

#### \* SEND FOR LITERATURE

U. S. HOFFMAN GORPORATION COOLANT FILTERS FILTRATION ENGINEERING SERVICE



# COMBINED AUTOMATIC OPERATIONS ...produce more

parts!

The brass cylinder plugs require drilling and countersinking as indicated on the drawing. The Kingsbury Fleximatic that does this complex job is assembled from nine standard Kingsbury drilling-head units and a standard Kingsbury base. The main indexing turret has ten duplicate work holders, nine of which are in working position while the operator loads and unloads the tenth. This means that the time of the longest single operation is the time to produce a finished piece.

The Kingsbury Pleximatic method is a means of performing automatically several machining operations accurately and quickly during a single chucking. It means that production of multiple machined parts can be increased, without overburdening operators, while production costs drop to a new low. Because Kingsbury Fleximatizs are made up of standard units, initial cost is surprisingly small for a special-purpose machine tool.

Are you interested in producing more parts, faster, and more profitably, through combined operations § Send sample parts or blueprints to Kingsbury today. Our engineers will be glad to submit cost and production figures — there is no obligation.

WE PUT OUR HEADS TOGETHER TO CUT YOUR DRILLING COSTS



#### **KINGSBURY**

MACHINE TOOL CORP.
KEENE, NEW HAMPSHIRE

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#### KINGSBURY FLEXIMATIC

— a special purpose modules for combined sustametic reportions during a single chicking —the result of Kingsbury engineering chility in the use of low cost standard Kingsbury shilling and topping—heads on standard Kingsbury buses.

## INDEX VERTICAL MILLS

FOR THE TOOL ROOM OR PRODUCTION LINE

For use with end mills 1/6" to 1" in steel. Equipped with verniers, as standard equipment in addition to micrometer dials on table actuating screws for locating. Further accuracy available with rods and indicators which can be furnished as extra equipment.

If you want speed and precision on milling, drilling and boring send for a catalog on Index Mills.



#### 12" TOOL ROOM ROTARY TABLE



A quality teel for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—aingle movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

#### INDEX MILLS

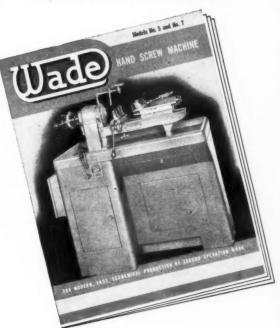
Index Mills participated in all important war production programs from camera and guns to atomic bombs. Ask any owner how they like their Index Mill.

Write to Factory Sales and Distributing Agents for complete information.

## BLANK & BUXTON MACHINERY CO.

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Here is a catalog bright and new Compiled by us to present to you



It's a key to higher profit

And it's free—just write us for it.



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| COMPANY |       |
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### GRIPPING FORCE 15 TIMES AIR LINE PRESSURE!

Seeking faster production methods, busy plants have discovered new, powerful Speedy Air Vises! From a single vise to an installation of fifty, they cut time, money and labor costs. Air operated, foot-controlled, both hands are left free for more rapid drilling, tapping, light milling, assembly, etc. Complete with Foot Control Valve, Air Hose and Fittings, only

ORDER FROM YOUR MILL SUPPLY DEALER OR WRITE DIRECT



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### HOW TO PREDETERMINE THE RESULTS OF TOOL-ING YOUR JOB ON A GORTON PANTOGRAPH

Send detail prints or a work sample to Gorton Engineering Service at the address below. Tooling information and production estimates will be furnished promptly-no charge or obligation. You can then predetermine the possible improvement over your present methods. 3-dimensional models to handle many types of reproduction assignments. They can be used with high

sistency with which they turn out quality work on a

production basis. They are available in both 2 and

efficiency on any machinable material and their opera-

Machining Time Reduced from

15 Hours to 3 Hours per Mold

ACCURACIES HELD TO .0005" Here's an example of the type of

performance you'll get on a Gorton 3-Dimensional Pantograph Engraving

Machine. This large manufacturer

experienced difficulty in the production of these injection molds. Time required was 15 hours per mold.

Accuracies were hard to maintain. Machine

FREE SECTIONAL

### tion is extremely simple.



July, 1946

MACHINE TOOL BLUE BOOK

# CONWAY CLUTCHES PLAY A BIG PART IN YOUR PRODUCTION



TO keep machines speeding along effortlessly, smoothly, efficiently the flow of power must be uniform and dependable . . . and CONWAY CLUTCHES play their part just that way. Put them to work in your plant.

### This is a CONWAY DOUBLE-THROW CLUTCH



## CONWAY CLUTCHES STANDARDIZED WITH INTERCHANGEABLE PARTS

Re-designing and precision engineering and production with standardization and interchangeable parts are the Conway method of helping you save time and costs.

In addition every Conway Clutch offers:

instant stopping and starting, drag-free idling, large lever ratio, ease of engagement, no exposed parts and many other features.

Patented U.S.A. and Canada

THE CONWAY

Write for Bulletin D345

CLUTCH CO. 1541 QUEEN CITY AVENUE

### Our 3 POINT POLICY

Insures Lower Production Costs for YOU

QUALITY Precision Built - HIGS - GAGES AND

1. Engineered for maximum production capacity

2. Built Right

3. Priced Right

Our customers like this 3 Point Policy. It keeps production costs down-helps keep them "in line." \* Every tool we design and build must measure up to this yardstick. If you need tools to get work out F-A-S-T and without interruption, drop us a line TODAY!

### QUALITY TOOL & DIE CO.

facturers of "Quality" Products

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### The CONE AUTOMATIC MACHINE COMPANY sees many

GOOD THINGS AHEAD

### It is reported that . . . . . .

U. S. Rubber promises that its solid neoprene tires will reduce the power consumption of materials handling equipment as much as 60%.

get ready with CDN E for temperow

Shell Development Company has patent rights to a new internally cooled piston in which the upper end of the connecting rod forms the top of the piston.

getready with CONE for towerrow

Glenn L. Martin Co. will make commercially available their wardeveloped process for printing photographs on almost any surface.

get roods with GON Elec tomorrow

B. L. McClure Inc. of Norwalk, Ohio, has been licensed to manufacture a limited number of Hickey engines. This 2-cycle engine has variable compression adapting it to various fuels and loads.

get ready with CDN Efer tomorrow

Du Pont has announced a new plastic, called "Teflon", which resists acids including boiling sulphuric and aqua regia.

get ready with CONE fee tomorrow

Promenette Radio & Television Corp. of Buffalo will make the electrical circuits on its radio sets by spraying metal lines on a plastic base.

getready with GUN Etertomoreum

Cleveland Transit System reports that its electrically heated switches performed well through last winter.

get ready with CONE for tomorrow

Eastman Kodak has two new photographic papers that can be developed in one minute, fixed in two and washed in four. Chance-Vought has developed a building panel made of balsa wood surfaced with aluminum sheets.

get ready with CHNE for tomoreus

The International Ice Patrol will go into service again equipped with planes and radar.

getrand; with GUNE for comurans

A Westinghouse engineer prophesies the use of gas turbines in

ships and central power stations.

Allis-Chalmers reports that the 3500 h.p. multistage gas turbine that it designed and built for the Navy has been operated at a gas temperature of 1350 F.

The Bunker Hill Naval Air Station at Peru, Indiana, has had three winters' experience with runways made with a cement dispersing agent. There seems to be no deterioration from freezing or deicing chemicals.

get ready with CONE for inmerrow.

Ford Motor Co. has patents on an amphibious vehicle that looks like a small edition of the Army's famous "duck".

got ready with CUNE for tomorrow

Buckminster Fuller's Dymaxion house is being readied for mass production by Beech Aircraft of Wichita. It is made largely of aluminum, weighs four tons, has 1017 sq. ft. of floor space and will sell for \$6500.

get ready with GUNE for tomorrow

Monsanto has a chemical treatment for cotton called "Syton" that is claimed to increase the strength of cotton yarn 40%.



# The Seft Rubber Binder

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For Finer, AU-In-One BURRING, FINISHING, POLISHING At Lower Cost

See how YOUR OPERATIONS between the grind and the built CAN BE REDUCED TO ONE with Brightbory.

DISCOVER the possibilities which Brightbory offers for cleaning and polishing action of its soft rubber kinder, which works simultaneously with the abresive.

ASK US about Brightbory work savings. Get Brightbory prices and new catalog from your dealer.

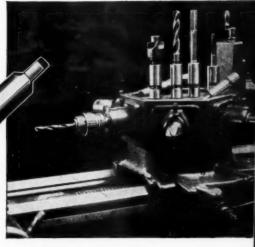
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Weldon Roberts Rubber Co.
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### ... need extra turret lathe stations?

Make them available with

MODERN-MAGIC CHUCK and COLLET EQUIPMENT



Modern Precision Tools STATIONARY SELF-OPENING Include . ROTARY SELF-OPENING DIE HEADS STATIONARY COLLAPSIBLE TAPS COLLAPSIBLE TAPS MODERH-MAGIC CHUCKS AND COLLETS SELF-OPENING STUD SETTERS INSERTED BLADE FACE MILLING CUTTERS SOLID ADJUSTABLE DIE HEADS ADJUSTABLE HOLLOW MILLING TOOLS UNIVERSAL CHASER GRINDING FIXTURES Modern-Magic Quick Change Chuck and Collet Equipment has repeatedly proved its value to turret lathe operation where there are not enough openings in the turret to accommodate all the necessary tools for the job.

In effect, Modern-Magic Quick Change Chuck and Collet Equipment makes available as many extra turret stations as are needed. The tools being inserted and removed, one after the other, to take care of each extra operation.

With Modern-Magic Quick Change Chuck-and Collet Equipment, tool changes are quickly and easily made. Production, is stepped-up and cost reduced.

For complete information covering Modern-Magic Quick Change Chuck and Collet Equipment, send for Bulletin No. M-101

Prompt shipment from stock

### MODERN TOOL WORKS

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ROCHESTER 10, NEW YORK

practical

TO YOUR MILLING **PROBLEMS** 

BRIDGEPORT MILLING MACHINE

The Bridgeport Turret Milling Machine with High Speed Attachment handles milling, drilling and boring at all angles, with maximum ease and convenience. It is accu-

powerful—a precision machine for production demands.

Shaping operation. Shaping operations can be performed at all angles, making this attachment fast and practical on die and mold work of all kinds, as well as for intricate slotting on production jobs.

Features include: 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

Bridgeport

WRITE FOR BULLETIN



### 5-PLUS FEATURES

- Greater accuracy and stability
- Longer wear life
- Less weight
- Positive identification
- Positive adjustment

ACCURACY YOU CAN TRUST

### WOODWORTH THREAD RING GAGE PROVES AMAZING SUPERIORITY OVER ORDINARY GAGES

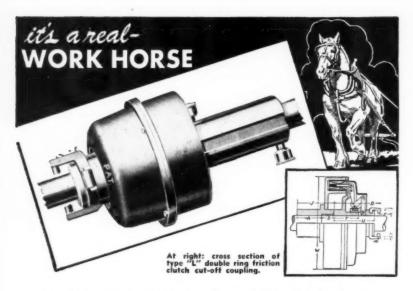
Records for durability . . . for accuracy . . . for economy! They're being established regularly with the new Woodworth Adjustable Thread Ring Gage.

AUTHENTIC SHOP ACCOUNTS TELL
OF MAINTAINING ACCURATE INSPECTION AS MUCH AS TWELVE AND
ONE-HALF TIMES LONGER THAN ANY
OTHER RING GAGE—AND ALL THIS
ON EXTRA-TOUGH JOBS, CHECK THIS
RECORD AGAINST YOUR EXPERIENCE
... CONSIDER WHAT IT CAN MEAN
IN CUTTING GAGE COSTS!

Then wire or write for our folder No. 46R.

### WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD - DETROIT 20, MICHIGAN PRECISION GAGES - PRECISION MACHINE PARTS - DIAPPRAGNI CROCKS - ADJUSTANIS CLAMPING 301 - SPECIAL TOOLS



For a heavy duty, Internal Expansion Friction Clutch you'll find a Hanson Type L just the clutch you're looking for. Especially designed for line-shaft installation ranging from  $2^{1/2}$  H.P. to 125 H.P. at 100 R.P.M.—by a company that has been making clutches over a quarter century.

Available in a wide range of size and bore with either cut-off coupling or extended sleeve. Known for ease of adjustment.

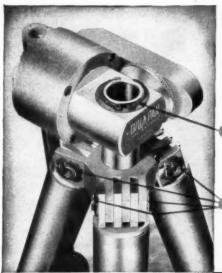
There are other Hanson Clutches to meet specific needs. Write for Bulletin B-76, indicating which clutch or clutches are of particular interest to you. Skilled Hanson engineers are available for consultation.

### THE HANSON CLUTCH & MACHINERY CO.

# HANSON Friction Clutches

for every clutch requirement, regardless of load or drive speed.

# HOW WALDES TRUARC BOWED RETAINING RINGS GIVE PRE-DETERMINED TENSION!



Trupan Tripod Manufactured by Accmatool Co., Inc., N. Y. 25

Waldes Truare precision retaining rings eliminate costly machining by replacing nuts, shoulders, collars and cotter pins. They allow lighter, more compact units—make assembly and disassembly quicker, easier. Truare rings give better, more dependable retention because their mathematically precise construction insures lasting, perfect circularity—insures a never failing grip. There's a Truare ring for every mechanical product.

# TRUARC CO

RETAINING RINGS

WALDES ROMINOOR INC., LONG ISLAND CITY I. NEW YORK

### NINE TRUARC RINGS ELIMINATE EXPENSIVE MACHINING ON

ACCMATOOL "TRUPAN" TRIPOD

Use of 9 TRUARC retaining rings in manufacture of the TRUPAN Tripod has resulted in a light, compact design—with reduced production costs. Truarc rings eliminate expensive machining required for nuts, threads, screws and shoulders.

A Truarc Bowed ring and a standard Truarc ring position the vital center pivot pin. The bowed ring exerts a downward pressure of 50 lbs.—gives two-way spring action—takes up end-play resiliently. "Shimmy" from cumulative tolerances in manufacture, or from constant wear is eliminated.

Each leg is positioned on its hinge by a spring washer and a standard Truarc ring mounted at either end of a small steel hinge pin. This construction assures constant tension. The Tripod sets up accurately without adjustments, indefinitely.



### FREE!

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sheets describing the
Bowed and
other newly
developed
Truarc Retaining
Rings.

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| Send me technic<br>developed Truar<br>Name & Title | c Rings.                | on the newly |
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| Address  |                         |              |
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Ready . . . Mead's new air-powered Impact Hammer . . . weighing only 27 pounds . . . yet having a wallop like a pile-driver! One of its outstanding applications is multiple piercing of large metal sheets before or after forming. It can punch holes as close together as 13/4" on centers. Value of the impact readily adjusted from 4,500 pounds down to only a few ounces. Set-ups are quick, easy. Besides innumerable punching operations, with suitable attachments it is capable of upsetting rivets, blanking out soft materials with knife dies, light coining, forging operations, etc. Get complete facts on this versatile. handy new tool and other Mead Air Power devices.

Write for Catalog.

### MEAD SPECIALTIES COMPANY

4114 No. Knox

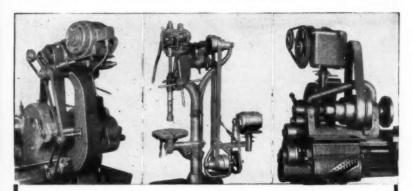
Dept. YA-76

Chicago 41, III.

#### THIS NEW SUPER TOOL BIT SAVES MONEY 7 WAYS! Check These New Super Features For Lower Production Costs! NEW SUPER EJECTOR-TYPE TOOL BIT Bit-Holding Mechanism is inside where it can't interfere with free chip flow or assembly in tool block. 1/4×1/4×2 3/8×3/8×2 The heavy cross section of well supported 3/4×3/4×41/2 Carbide insures the successful making of ORDER 3/8×3/8×2 deep cuts and heavy feeds without cracking. 3/8×3/8×2 Txlxl 11/4×11/4×8 EL-1 Absence of brazing strains due to mechani-3/8×3/8×2 11/2×11/2×8 EL-2 cal holding of tip. ER-1 3/8×3/8×2 EL-3 3/4×1×6 3/8×3/8×2 Tool life is doubled due to compound an-ER-2 EL-4 IxI /Ax8 gles used. When the Carbide bit is ejected, ER.3 EL-5 121/228 it rises in the holder, permitting a light re-ER-4 grinding cut on top, end, and side, produc-EL-6 ER-S ing a new, sharp cutting edge with the absolute minimum loss of Carbide. EL-7 ER.6 No steel is removed in grinding, insuring rapid and economical reconditioning of SIZE Replaceable Carbide bit is extra long for longer life. 1/4×1/4×2 Each holder can be used for machining any material. Replaceable Carbide bits are 3/8×2 furnished in proper grade for each job. FOR EG-1 EG-2 ES-1 Super Tool Company ES-2 Carbide Tipped Tools 21650 Heever Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

### BERKELEY-

### Helps You Cut Production Costs



BERKELEY does more than merely sell you drives for your machine tools. He analyzes your production requirements and gives you drives designed specifically for your needs. Each drive is conscientiously entireered to give you the maximum production of which your machine tools are capable.

BERKELEY can supply drives for practically all types of machine tools — sturdily built for dependability and minimum maintenance cost. Experience proves that BERKELEY drives soon pay for themselves through savings which they make possible.

Put your drive problems up to BERKELEY today — there's no obligation!

### BERKELEY EQUIPMENT COMPANY

1022 Bahls St.

82

Danville, III.



### Soundly Engineered to Cut Machine Hour Costs

More and more production men are beating rising material and man-hour costs on small-parts operations by installing compact Atlas tools.

The Atlas 15" drill press — with its lower investment and lower operating cost — will trim expenses on the full range of small-hole drilling and tapping operations.

Atlas' unique "Floating Drive" spindle head, with 4 SKF ball bearings — soundly housed and supported with heavy well-braced castings — assures smooth, high-speed precision operation.

There are 9 speeds between 600 and 5200 RPM. Jacobs Chuck — capacity

Y₂"—standard equipment. The 10"×10" table is fully tilting, travels 12" vertically on the bench model and 40½ on the floor model. Motor recommended, 1/3 or ½ HP. By adding air chucks, cut-off switches and other special production aids, many plants secure amazingly high output from a small equipment investment.

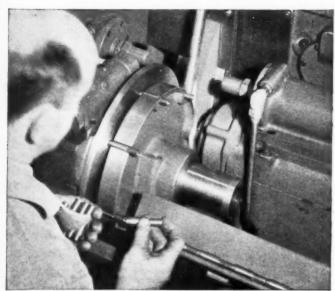
Ask your Atlas distributor for full details. Send for latest catalog.

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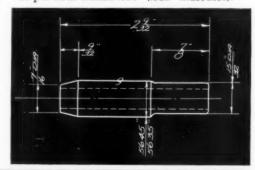






On this VALVE STEM GUIDE-JOB there is no necessity for using arbors. Special low angle centers enter the bore at each end, thus controlling concentricity of ground outside diameters with the bore. Production—700 per hour within .001" (.002" indicator).

This VALVE STEM GUIDE is but one of many jobs for which this versatile ARTER can be tooled.



### ARTER GRINDING MACHINE CO.

WORCESTER, MASSACHUSETTS • U. S. A.



Lubro-Control Units preserve the built-in performance of air driven tools and cylinders and stop excessive wear by eliminating air-borne impurities that cause it.

Compact unit of filter, regulator and lubricator is less than a foot long—easily installed right in the air line. Filter stops air borne grit from reaching the heart of the air tool. Regulator smooths out uneven air line pressure, delivers steady stream of power at any desired pressure. Lubricator injects oil into air-stream, creating air-oil fog—lubricates all moving parts of tool while operating—protects them against rust and corrosion while idle. Only Norgren Lubro-Control Units give this 3-in-1 air tool protection.

Write for complete information. C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colo. Norgren



The New Procunier "TRU-GRIP" TAP HOLDER

A new practical tap holder with many advantages, A broached section of the chuck receives the flattened surfaces on the spring collet, while the tap has a positive drive through the square hole broached in the collet. The tap is always in true alignment—tap shanks are never scored or "chewed up."

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Please send me free bulletins on

() Procunier High Speed Tapping
Heads. () Procunier Tru-Grip Tap
Holders. () Universal Tapping Machines.

 The new Procunier sensitive highspeed tapping head allows fast, accurate tapping with a minimum of tap breakage. Driving power to the tap is automatically regulated by pressure applied to a special clutch. This double-cone, cork-faced, friction clutch engages the conical surfaces of the drive and reverse shells, driving the tap with a soft "cushioned" action. The high sensitivity of the clutch practically eliminates tap breakage. Operators can quickly detect dull or loaded taps by the "feel" or pressure required to drive themalso, the clutch instantly slips should the tap strike bottom or stick because of tap loading.

Send coupon for circular giving full details, specifications and prices.

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# ANNOUNCING THE HYDRAULIC INTERNAL GRINDER 60" MAX. WORK DIA. Another Bryant Postwar Development

The NEW Bryant No. 150 is a giant "internal grinder" with typical Bryant "fingertip" control. It retains the famous Bryant feature of three-point wheel slide suspension which is the basis of Bryant's reputation for high production of occurate

work with fine finish.

The NEW Bryant No. 150 has a preloaded antifriction cross slide, assuring smooth cross feed operation in spite of the size of the machine. Both hand and power cross feed are available and in addition, a hydraulic cylinder slides the wheel spindle to the rear to provide ample access for work loading or checking. The work spindle is bored out to accommodate spindles or other long work which may be chucked conveniently by extension through the work spindle. The work spindle is designed so that chucks or fixtures may be mounted on either or both ends.

The NEW Bryant No. 150 will handle bore or bore & face grinding in a single chucking, and bores may be either straight or tapered. Write for a copy of the new catalog sheet which gives full details, capacities and dimensions.

If your internal grinding work comes within the range of 1/16 inch diameter bore up to 60" diameter swing, it will pay you to

Send for the Man from Bryant!

BRYANT



BRYANT CHUCKING GRINDER CO.

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M ORE precious to this company than all its physical assets is UNITED STATES TRADITIONAL QUALITY... more precious to you is the quality which puts money in your pocket because the tools stand out as superb examples of the toolmaker's craft.

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Simplicity of design makes chips fly faster on a Rogers Mill when boring, drilling, turning and threading ferrous and non-ferrous castings and forgings. Check these features:

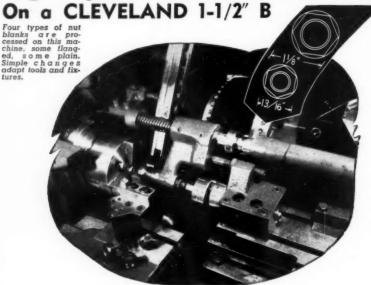
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"The hand is quicker than the eye", but for chucking cast-iron hex nut blanks this set-up on a Cleveland Automatic is quicker than the hand, and more productive. Carbide tools and fast spindle speeds deliver up to 135 nuts per hour.

Cored blanks are fed from a magazine . . . A cradle actuated by the rear cross-slide advances to center with one blank . . . Conveyor finger actuated by milling slide forward and return motion swings down and withdraws blank from cradle, which then pulls back for reload . . . Milling slide approaches chuck, conveyor finger inserts blank in rotating jaws . . . Air valves, operated from camshaft, closes chuck, and conveyor withdraws . . . Cross slide turning attachment drills, ID to work size, broadfaces and chamfers ID and OD . . . Milling slide handles tapping . . . Air operated chuck opens and ejector spring, loaded by insertion of blank, ejects finished nut.

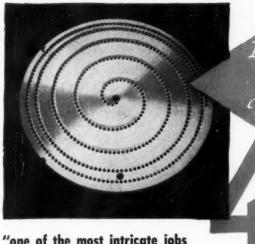
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Demonstrating

"one of the most intricate jobs we have done," says FAIRCHILD CAMERA AND INSTRUMENT CORP.

The part is a sine cam for an automatic computer, a flat aluminum disc upon which extruded gear teeth form a spiral path. A SIP Jig Borer was used for boring the 437 holes in the dies for extruding these teeth, and for bor-ing similar holes in the gage on which the extruded work was checked.

The spiral tooth position was held to within  $\pm .0005''$  in radial location and to within 30 seconds of the computed location in angular position, tolerances not accumulative.

Unusually high precision? Yes, but it is a typical example of the precision and convenience of operation of SIP Jig Boring Machines in connection with SIP Circular and Tiltable Tables. In fact, the SIP Jig Borer is one of the few existing machines capable of working to such extreme limits of accuracy. Whenever the highest precision is needed, achieve it with a SIP Jig Borer. We would be pleased to have your engineers consult with us.

#### Range of Table Sizes

| No. |      |        | •••••         | 18" x 103/4"  |
|-----|------|--------|---------------|---------------|
| Hyd | ropt | ic-B   | (illustrated) | 39½"x32"      |
| No. | 4C   | ****** |               | 271/2"x235/8" |
| No. | 5C   |        |               | 433/8"x32"    |

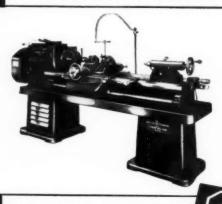
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Equipped with disc clutch... Easy to operate... Rigid Construction... Four speed headstock... Return or Idle travel speed has been increased, five times cutting speed.

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Crobalt is a non-ferrous cutting alloy containing principally chromium, cobalt, tungsten, vanadium, zirconium and carbon. Crobalt tool bits will cut much faster and will require grinding less frequently than do tools made of high speed steel. Crobalt also offers far greater resistance to chipping than do carbides.

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All these models assume a low, horizontal position. There are no obstructing handles to interfere with free movement of drills passing over clamped work. There is a size to meet every need.

MODEL KP 185 has solid bar.

MODEL KP 186 provides channel for positioning pressure spindle.

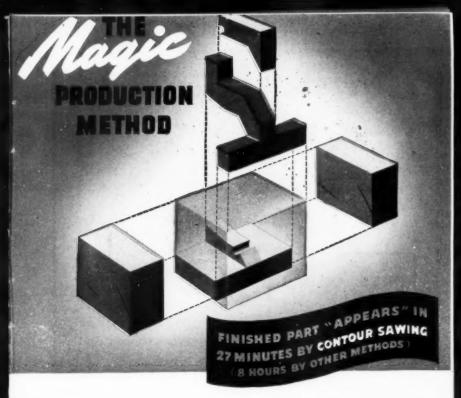
MODEL KP 831 and KP 835 are mighty midgets with incredible strength. Hold materials up to ¾". Both have channel bar to permit range of lateral spindle adjustment.

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Above 3-dimensional part, contour-sawed on a DoALL by Royal Typewriter Co. Hartford, Conn. Countless other jobs are similarly produced from stock instead of being cast or forged and machined by ordinary methods. All metals, even tough alloy steels, a foot or more thick, are precision cut on a Contour Saw.

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# Localized coolant Filtering

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**Doubles Wheel Life** 

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Reduces Wheel Dressing

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**Speeds Production** 

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**Makes Finer Finishes** 

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**Eliminates Spoilage** 

Leading manufacturers, everywhere, by their cost and production records, have proved the remarkable efficiency and economy of Fostoria Coolant Filters. Installed on individual grinding machines, this low-cost filter insures a constantly clean coolant, free from injurious foreign particles. Try a Fostoria Filter on approval—see the difference in finer finishes and faster, lower cost production.



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# Replace Costly Errors with ECONOMICAL ACCURACY



Accuracy begins with the surface plate. We don't have to tell you that errors beginning with inaccurate surface plates are transferred to tools and to the finished product — causing rejections, waste and out-of-line costs. Replace these errors with economical accuracy — Herman Precision Granite Surface Plates cut from solid blocks of naturally goed bedrock granite.

Herman Granite Surface Plates are accurate to 50/1,000,000 inch; warp-proof, non-abrasive, non-corrosive and non-magnetic, they need no scraping, cannot become charged with filings. Outwear ten ordinary cast iron surface plates. Save their cost many times over in economy of fine tools such as "Joe blocks" and height gauges. Put this economy in effect in your plant.

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12" x 18" size, \$75 F.O.B. Dayton, O. Other regular sizes: 18"x24"; 20"x30"; 24"x36"; also special sizes up to 4' x 6'.



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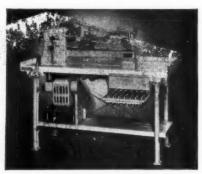
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### Elgin Knee Hole Type Bench Lathe

Has Variable Speed Drive with range from 120 to 3800 RPM. 9" swing, 12" between centers, 1" collet. Generous leg room for operator. Door of motor cabinet fitted with collet rack. Three roomy storage shelves.



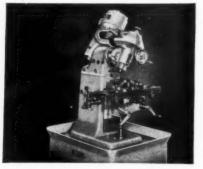
### Elgin Open Bench Lathe

Laminated hard maple top, enclosed motor, safety guard for belt, handy collet drawer. Variable Speed Drive for any spindle speed from 120 to 3800 RPM. 9" swing, 17" between centers, 1" cellet.



### Elgin Knee Hole Type Hand Screw Machine

Variable Speed range, 120 to 3300 RPM, 9" swing, 1" collet capacity, Collet rack inside of motor compartment door, independent coolant system (5 gal.) mounted in rear, outside—cleaner, more accessible.



### Elgin Vertical Bench Milling Machine

Preloaded ball bearing spindle. 9/16'' collet capacity. Five speeds ranging from 400 to 4000 RPM. Vertical travel of spindle, 134'''. Table 4/9''x18'', 90° swivel each side of center line.



# **Efficiency**

WITH

# ELGIN

### BENCH TOOLS

The entire line of ELGIN High Speed Precision Bench Tools is designed to pay you dividends in better machining results, faster production, greater versatility, maximum operator convenience. The machines shown here assure "complete coverage" of your needs for both toolroom and production work. Note the trim, clean-cut lines . . . the provisions for operator comfort . . . the ample storage space for tools and accessories. And remember-the Elgin Bench Tools shown in the large illustrations (with exception of Vertical Miller) are equipped with the VARIABLE SPEED DRIVE which permits instant changes of spindle speeds over a wide range of RPM without stopping spindle and shifting belt. Operator is encouraged to use proper speed for each operation, changing as often as necessary . . . which means closer precision, better finishes. Write for specifications, prices, delivery dates!

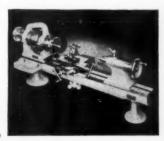


### Elgin Desk Type Bench Lathe

Variable Speed Drive, 40 to 4000 RPM. Low speed rate for grinding operations. Free turning spindle for truing-up and setting work by hand. Ample drawer space. 9" swing, 17" between centers, 1" cellet.



Two Lathes at Right (reading top to bottom)



### Elgin Horizontal Bench Milling Machine

Variable Speed Drive, 85 to 2750 RPM, Collet capacity, 1", Table 4\(\(^{\alpha}\_{\alpha}\)'' x 18". Longitudinal travel, 12", Transverse travel, 6". Vertical travel,

1772 BERTEAU AVE. CHICAGO 13, ILL.

#### (Upper) Model CB-5C Precision Bench Lathe Open Come Headstock. 1" collet capacity, 9" swing, 17" between centers, 38" bed. Speeds up to 400 RPM. Flat bolt only.

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with the INTERCHANGEABLE HEAD

An important NEW development that enables ONE machine to do the work of many

No longer is it necessary to buy and set up individual machines for each individual tapping operation. By simply changing the head, every tapping job within its capacity can be handled with this ONE machine. It will tap out a single hole—or a dozen—in any pattern—provided the work is confined to a 10" x 12" area. Center distances, between spindles, can be held as close

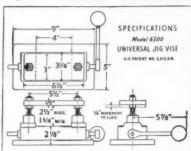
as 1°. It will do the work with precision and accuracy. It will do it automatically—at high speed—with one operator in place of many. No expensive outlay for additional machines. No idle machines between jobs. Operator's time is utilized to the utmost. Floor space is conserved. Simple, dependable operation—with assurance of uniform, accurate work.

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#### of 8 TIME and MONEY-SAVING TOOLING AND PRODUCTION SHORT-CUTS



#### ACTUAL SIZED TOOLING LAYOUT WORK-SHEETS

This time and money-aving tooling and production "SHORT-CUT" (No. 2) saves many technical tool designing hours. Actual sized and accurately dimensioned—it is all ready for Tool Design Engineers to sketch in nest and pattern bushing plate and have ready by the time the Universal Jiq Vises are received. MAILED—NO CHARGE—immediately upon

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Plan your RECONVERSION TOOLING — NOW — with the aid of these ready-to-use accurately dimensioned tooling layout work sheets.



#### SPEEDS RECONVERSION

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new holding fixture.

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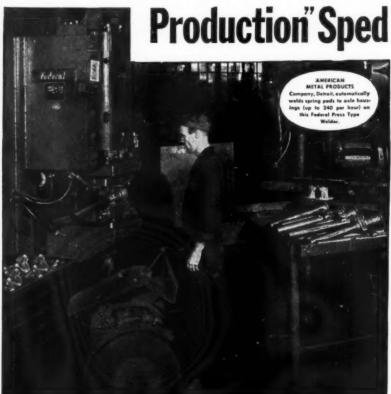
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you are engaged in drilling, milling, tapping, slotting or assembly operations, and want to save tooling time; want to pull down production costs — send for bulletin featuring the "8 time and money-saving tooling and production SHORT-CUTS" which this amazingly speedy production tool affords.

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BULLETIN SP 346—Describing Federal Spot, Flash, Projection, Seam and "Gun" Welders is yours for the asking.

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MACHINE

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For instance, you can take a heavy-gauge steel tube like this,-> which is a rear axle housing

component, and a heavy gauge stamping like this, -> which is a spring pad; insert them in a Federal PA-4 Press Type Welder with simple dies (shown left) and they come out as though one piece of metal . . . but stronger. Fifteen seconds total time. That's four pieces a minute.

Note the three nubs projecting inwardly on each side of the saddle portion of the stamping. At these points of contact between stamping and tube, welds initiate. Under heat and pressure the parts are forged together in these areas, the junctures becoming stronger than surrounding parent metal.

To the vast saving of time, against previous joining methods, add time savings on final assemblies and great economy in material resulting from this design. (Heavy castings were used where lighter but tougher stampings now do the job). There you find the rea- ACCESSORIES sons why industries noted for making the most of needed goods at the lowest cost are largest users of Federal Resistance Welders.

This is typical of hundreds of Federal welded jobs produced by the American Metal Products Company of Detroit, makers of quality parts for many industries. It is typical too, of thousands of other production-speeding, cost cutting methods possible with Federal Resistance Welders.

Every delay of full-scale production for the dammed-up needs of world markets through shortages of material or of work makes the need for eventual production speed more important ... lowering of unit costs more urgent. When you find out (through the Federal Engineering Service nearest you) how you can cut cost and time in YOUR production with automatic welding, be sure that you get Resistance Welders by ... Federal















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WELDER COMPANY

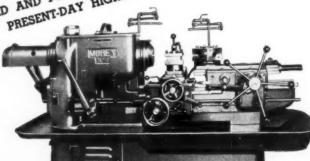


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For bar slock up to 2" in diameter For bar stock up to  $\frac{2}{3}$  in diameter bed  $\frac{12}{3}$  turning length,  $\frac{19}{2}$  35 to 1500 RPM, Infinite spindle speeds: 35 to PDE MAY BE HAD WITH PLAIN CROSS SLIDE constant speed motor, 1200 RPM Also available in No. 3 Universal. 11/2" capacity
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Basic gage material must fully meet use requirements. VARD gages are made of Timken Graph-Mo steel, hard chrome plate or Norbide (Norton Co.'s boron carbide).

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VARD gages are shaped on batteries of modern grinding machines — in temperature controlled rooms by expert gagemakers.

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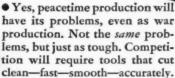
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# THE GLENNY Adjustable · Expansion PUSH BROACH

Maintains + .0005" accuracy

Broaches slots and keyways of greatest uniformity and accuracy to an average length of five inches and up to 5/8" widths. May be used on an arbor press, lathe, screw machine and other standard equipment. Has many valuable uses in shop and factory.

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Actual tests in cutting keyways 3/16" deep, 3/8" wide, 1-1/2" I.D. and 3" long in a steel bushing proved ten times quicker than in handling the same operation on a shaper. Send for Bulletin 9. Learn more of this and other similar operations.

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Patent No. 2,184,383

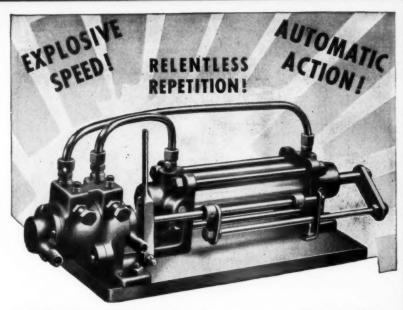
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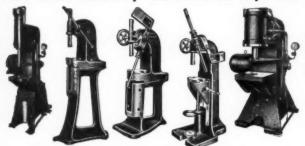


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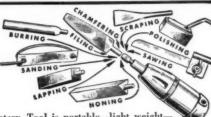
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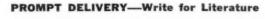
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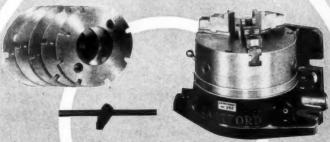
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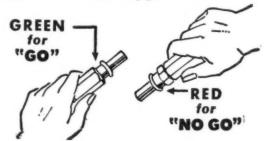
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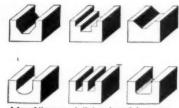
American Brake Shoe & F. Co. Kellogg Division, Southern Wheel Division Bendix Aviation Corp. Cessna Aircraft Corp. Chicago, Rock Island & Pacific R. R. Co. Chicago Screw Company Doehler Die Casting Co. Electric Auto-Lite Co. Frisco Lines Imperial Brass Mfg. Co. Monsanto Chemical Co. The New York Air Brake Co.

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# NEW-FIELD Universal FLY CUTTERS



#### A few of the many cuts that can be made in one operation with the New-field Fly Cutter.

## FOR SLOT CUTTING — STRADDLE MILLING — FLAT SURFACES — ON ALL METALS AND PLASTICS

These new EXTRA HEAVY CUTTERS add strength for heavier machining. Like other models they use standard high speed steel or carbide bits — eliminate need for special cutters — speed production — cut maintenance and down-time costs.

Fly-wheel action increases cutting momentum — gives more precise finish — less heating of the finished surface. Adaptable for high rate milling on all classes of metals and plastics.

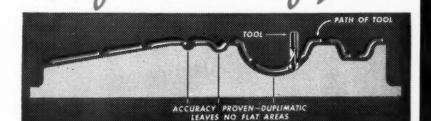
The perfect form of multiple fly cutter — eases load and impact on milling machines, lengthens cutter life between grinds, permits more chip removal per horse power.

Regular models 4" to 10" diameters —  $\frac{5}{8}"$  and 1" width. Extra Heavy, 6" and 8" diameters,  $1\frac{3}{8}"$  width. Write for latest descriptive bulletin.



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Contouring



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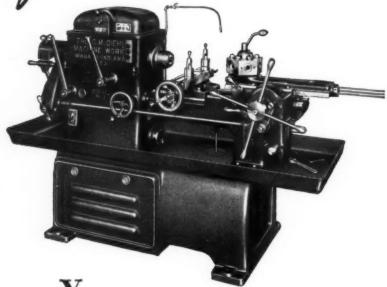


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6 speeds.....forward and reverse
6 feeds......to turret slide

The G. M. DIEHL MACHINE WORKS, INC

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## Jeatured In This Issue

PRECISION MEASUREMENT is unquestionably here to stay. Man has been described as a measuring animal and the things he learned in the years just before and during the war he will not forget. One of the most important of these lessons was standardization and there can be no standardization without standard measurements. This is the first of a series of articles on measurement by Warren baker starting on page 129.

TURRET LATHES, Part IV by John E. Hyler introduces some additional models of machines and explains the salient features. Considerable information is given on tooling for different types of jobs some of which are illustrated. See page 153.

GRINDING WHEEL SELECTION is the topic discussed by John F. Fischer. In a previous contribution he had explained how manipulation of the wheel can influence wheel performance to some extent. There is a limit to what can be done along this line and for best overall performance it is essential to have the correct wheel for the job. The story starts on page 175.

AUTOMATIC PRESS ACTION by John E. Hyler reviews some of the means that have been employed for speeding press production. Included are the different types of feeds for handling the work quickly and effectively. See page 189.

GRINDING SETUPS and how to simplify them toward the end of speeding production—that's the subject discussed by Karl F. Kirchhofer. He illustrates and discusses a number of typical jobs in the story commencing on page 205. THREAD CUTTING difficulties may be caused by a number of factors. Much of the trouble can be avoided by getting all of the mechanical conditions right at the outset. G. E. Mager reviews some of these troubles and tells what to do about rectifying them in the story commencing on page 217.

EXPANSION and Modernization are discussed by Arthur Roberts in his series of articles on Tax Problems. Some helpful and pertinent suggestions are offered. See page 233.

PRACTICAL APPLICATIONS OF ADJUSTABLE SPEED DRIVES by B. T. Anderson Electrical Engineer for the Sundstrand Machine Tool Co., is a good illustration of the ingenuity of our engineers today. You may need to overcome problems similar to those described in this article—sorry we didn't have the illustrations. Page 245.

WORM GEAR DESIGN offers a number of suggestions by H. F. Williams for simplifying problems in this field. See page 260.

VETERANS AND INDUSTRY is a frank and constructive discussion of the problems involved in the placement of veterans. The author, Sidney Marlin, tells what has been done at Caterpillar Tractor in the story commencing on page 265.

FEET AND LEGS for Jigs and Fixtures offers some helpful suggestions along this line by H. F. Williams. See page 275.

WHAT'S NEW is the regular parade of new equipment and new tools commencing on page 278.

MECHANICS THRU THE AGES, commencing on page 360.

PRODUCTS INDEX offers an easy way of finding the equipment you want. See page 362.

### Increase Shop Capacity and Efficiency

Increase shop efficiency and you increase production capacity. Work moves smoothly, swiftly, surely, and in greater volume, through the efficient shop. Modern, efficient, precision machine tools are one of the first essentials for maximum efficiency.

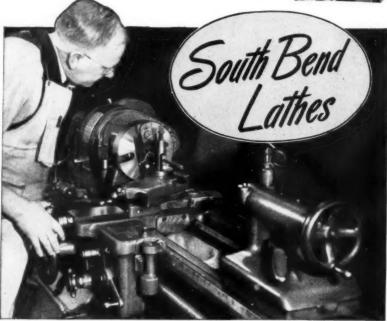
Famous for versatility, South Bend Precision Lathes bring peak efficiency to shops where frequent changes of set-up are called for and a variety of materials are used. And their modern design, with convenient controls and full quick change gear equipment, means less fatigue and less "machine scrap" due to such causes.

If your shop problem is to increase efficiency, it will pay to consider the installation of South Bend Precision Lathes when new equipment is added, or present equipment is replaced.

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Catalog 100-D shows in color all sizes and models of South Bend Toolroom, Turret, and Engine Lathes. Made in 9", 10", 13", 14-1/2", and 16" swings. Accessories and attachments shown,







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SOUTH BEND LATHE WORKS

# as The Editor Sees It

ANUFACTURERS, many of them, know that equipment which increases output, lowers costs and makes a better product not only is a definite contribution to mass production technique but also creates new jobs through increased demand. To the mind of management, this principle is basic . . . and to them so simple that even a school boy should be able to understand. But when this same executive is confronted by his own employees and their high priced union leaders with the theory that "more machines mean fewer jobs" he is frequently at a loss to explain the soundness of his own thinking in terms which his people can comprehend. The inevitable result of management's inability to "sell" fundamentals is to slow down technological progress . . . keep up prices by restricting output to the capacity of antiquated machines . . . and robbing the country of benefits to which its citizenry including his own employees are entitled.

What can be done?

The suggestion advanced by Joseph Trecker, executive vice president of Kearney & Trecker Corporation, is to educate management through the business papers which industrial executives read. Secondly, to get the true story . . . of the necessity of keeping American ingenuity unbridled . . . across to the employees in the plant and to the man on the street. An informed management with the ability to defend their convictions combined with an enlightened public should forever banish the outmoded argument that more efficient machines bring unem-

ployment and depression. Because of the resulting harm which ignorance can do to our future progress as a nation, the seriousness of the problem cannot be overemphasized. It was thereencouraging to listen to Mr. Trecker as he spoke recently in Milwaukee of his convictions on this subject to about a hundred representatives and editors from industrial business papers. The invitation to the press came from this well known leader in the machine tool field and a former president of the National Machine Tool Builders Association. He not only presented the problem but asked the assembled guests what must be done. It is from discussions such as these . . . when industrialists and the editors of business papers take the time to sit down together and frankly face the issue . . . that progress toward a solution can be made. Out of this meeting will undoubtedly come new ideas and plans which if coordinated into proper channels can bring about the understanding which management-labor conferences so sorely need in these days. Hence the task of bringing the "light" of knowledge to those groping in the "darkness" of century old fallacy is the step which must be taken after management is taught how to explain and sell that in which it believes. This education should begin at the local level ... of individual plants and then entire communities including its religious leaders, teachers and newspaper editors. Such a campaign can be launched and must succeed with the result that truth will triumph and America will resume its march forward.

# Use HIM...and the



A good rule for good distributor service... CALL IN your

# picture is complete



Key figure in modern efficient buying, your local CARBORUNDUM distributor offers prompt intelligent service for your abrasive requirements. No one is in better position to give you what you want, how you want it, and when you want it. From large and varied assortments of standard types, sizes and shapes, your order for wheels, coated abrasives, and sticks by CARBORUNDUM receives immediate attention.

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Take a careful look at this close-up of Inland 4-Way Floor Plate. Note the 4-way projections. Now read of the advantages Inland 4-Way Floor Plate provides:

 Safer traction. Wherever sure footing is important, on walkways, stairways, around machinery, on floor and steps of trucks and other moving equipment, the projections of Inland 4-Way Floor Plate grip feet or wheels from every angle. Give 4-way protection against dangerous falls.

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 Great structural strength. The overlapping projections reinforce lengthwise and crosswise giving Inland 4-Way Floor Plate greater stiffness.

Then you get the additional advantage

of a continuous pattern that is pleasing in appearance; matches whether laid side to side or end to end and permits sweeping and drainage in four directions.

Inland 4-Way Floor Plate is available for quick delivery from Ryerson Steel-Service Plants, in two pattern sizes and several thicknesses. Write for catalog and samples too if you care for them.

Joseph T. Ryerson & Son, Inc. Steel-Service Plants at: Chicago, Milwaukee, Cleveland, Cincinnati, St. Louis, Detroit, Philadelphia, Pittsburgh, Buffalo, Boston, New York.

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## RYERSON STEEL



#### **Precision Measurement**

#### By WARREN BAKER

#### PART I

#### INTRODUCTION TO PRECISION MEASURING EQUIPMENT

URING the years of the recent war, much was written on the subject of precision instruments. Unfortunately, a great deal of it either was too elementary to be of any considerable value, either to the man using the more precise measuring devices or to the man who must keep them measuring accurately.

It is the purpose, therefore, of this series to present to the user and the inspector of today's highly precise instruments, the methods of using them correctly and the means of determining their accuracy. Too much of the literature of recent years has been concerned only with the simple and somewhat outmoded measuring devices, or else it has been content merely to describe the more intricate ones, without any attempt at explaining their operation or repair.

Precise measurement unquestionably is here to stay. Man has been described as a measuring animal and the things he learned in the years just before and during the war he will not forget. One of the most important of these lessons was that of standardization, and there can be no standardization without standard measures. As one engineer has put it, you can't control quality until you can measure it, and it has always been man's way to demand better quality in the products he buys.

Granted then, without further detailed argument, the need for continued quality control and the need for the instruments that make such control possible, let us survey the field a bit in advance:

(Photos, courtesy DoAll Co., Ford Motor Co. and Lincoln Park Industries.)

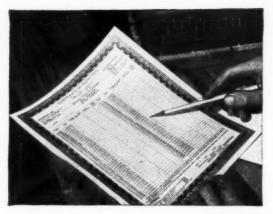


Fig. 1—The inspection certificate shows the actual size of each gage block to the nearest millionth.

This work will be in two parts. The first will take up the instruments the tool inspector must use to be sure his production instruments are measuring as they should.

The second part will consider the use of these "inspectors' instruments" in the measurement and calibration of production inspection equipment, from the simplest to the most complex, even including the checking of the inspection instruments themselves. Readers are advised to save each installment as it appears in this magazine so that, when complete, they will have the entire work available for ready reference. Even if it should not be required immediately, problems are certain to arise in the manufacture of small, intricate and precise parts and devices that will require answer at some future date.

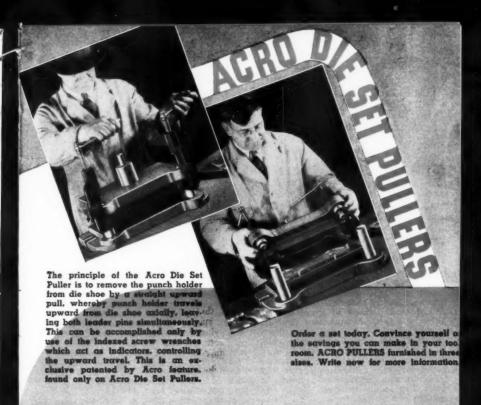
#### **Tolerances**

We shall not, in this series, set up hard and fast tolerances either of manufacture or inspection. The reason is this:— The tolerances required in any instrument depend, in the last analysis, on the tolerance allowed in the device you are going to measure with it. It works this way:

Few production inspectors, save in some highly specialized industries such as certain phases of the aircraft manufacturing business or the making of precision instruments themselves, will be expected to measure ordinarily in units of less than a ten-thousandth of an inch. To control the dimensional accuracy of their instruments, then, the tool inspector must measure in hundred-thousandths of an inch. In a few cases, the tool inspector must measure in millionths, and sometimes in units smaller than that.

It is obvious, of course, that in a plant making bath-tubs, let us say, where the production workers and inspectors are likely to use no instrument of greater accuracy than a machinist's rule graduated in sixty-fourths or hundredths of an inch or perhaps a master pipe thread plug gage with a tolerance of a hundredth of an inch, a tool inspector would be setting up and expecting impossibly foolish standards if he insisted on tools that measured to a tenthousandth. On the other hand, the tool inspector in a shop making gage blocks, where production tolerances are measured in millionths, would have to measure in ten-millionths or less to control the accuracy of his inspection tools,

The American Standards Ass'n, working with or accepting the tolerances set up by the U. S. Bureau of Standards, has cataloged thousands of tolerances for all sorts and classes of instruments and equipment and parts. These are readily available in the Ass'n's. literature to those who insist on a "standard" tolerance. The Ass'n recommends, for

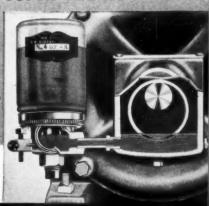


Dual visibility — Sight glass on side of inbricator bowl an exclusive SUPER feature, shows exact oil level maintained in bearing plus oil supply in reservoir, eliminating quess work.

There is no drippage, no waste, no over flow. Oil is automatically led to the bearings as required.

Nationally known authorities estimate that 75 per cent of all machinery repairs are caused by inefficient and improper lubrication, and that 25 per cent of the oil bought for lubricating purposes is never used by the bearing surface for which it was intended. WRITE FOR LITERATURE.

#### SUPER LUBRICATOR . . .



ACRO

PROMPT

METAL STAMPING COMPANY: 332 E. RESERVOIR AVENUE MILWAUKEE 12, WISCONSIN



Wear blocks of tungsten carbide are used on the ends of combinations, particularly for production inspection.

instance, a tolerance of 1/64" in a machinist's rule graduated in sixty-fourths. Usually that will be tolerance enough and perhaps to spare in any industry where measurement depends on accuracies no greater than those ordinarily afforded by such a rule. Nevertheless, this writer has seen production and even tool inspectors spend hours carefully calibrating a rule and using it for measurements down to what they fondly believed were thousandths of an inch! Obviously no tolerance of a 64th could be allowed in such a case.

Therefore, let it be emphasized again that tolerances are supposed to work for the inspector, not against him. They depend solely on the dimensional accuracy that must be maintained in the part or instrument being measured, and no hard and fast "standards" can be set up to cover all cases by anybody. "Standard" tolerances will be mentioned and cited from time to time in this work, but they will be given only for comparison's sake. Let no tool inspector become a slave to them. Let the conditions that obtain in his own shop be his guide at all times.

#### SECTION I — PRECISION INSPECTION INSTRUMENTS

MOST of precision tool inspection lies in the realm of what is usually termed "super-precision," which means that it concerns the use of instruments measuring in hundred-thousandths or millionths of an inch. This brings us to one more general point:-No one can say that a measurement is exactly thus and so. There is no such thing as exact measurement, even in these modern days when man takes pride in the fineness of his measurement and looks back with headshakings and, perhaps, even sneers at misguided ancestors who measured in yards that depended upon the length of a British king's arm: inches that were the width of someone's

thumbnail; cubits that varied from country to country; or even meters that were determined by French "mathematicians" unable correctly to subtract and divide.

Measurement is a relative thing, just as relative, in cold fact as Einstein's theory. One says nowadays that a measurement is thus and so, "plus or minus" a certain agreed upon tolerance for human error. Even the length of the wave of red cadmium light, the "standard" of today's measurements, may vary depending upon how much impurity there be in the cadmium or error in the instruments that interpret it.

# Get ALL the advantages of magnetic holding

#### Use Brown & Sharpe Permanent Magnet Chucks

#### COST NOTHING TO OPERATE . EVEN TO INSTALL

- ★ No electricity, wires, electrical connections, generators or brushes.
- ★ Nothing to maintain. Special alloy magnets retain energy indefinitely.

#### SIMPLE MECHANICAL CONTROLS

- ★ Hand-operated. Easy 180° movement from ON to OFF position.
- \* POSITIVE HOLDING
- \* INSTANT RELEASE \* plus wide variations of holding force for easy positioning of work.

#### SAFE FOR WORKMAN AND WORK

- ★ No danger of work flying off due to power
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#### MORE USEFUL IN MORE PLACES

- \* Portable . . . for use on various machines, also for testing, inspection and laying out work.
- \* Wet or dry grinding.
- \*Large, heavy work or groups of small parts.

\*These chucks are for only in the United States America and its Territori



ROTARY MODEL for grinding operations and light cuts on lathes.



For use on surface grinding machines and for bench work. Also for light cuts on planers, shapers and milling

ALSO permanent magner V blocks and dial test indicators with magnetic

WRITE FOR CATALOG describing operating principles. BROWN & SHARPE MFG. CO., Providence 1, R. I.

BROWN & SHARPE

There are four principal classes of instruments that measure to super-precision. These are (1) Gage Blocks, the easily transported little oblongs or cubes of metal that are the foundation stones of interchangeability in modern industry; (2) Comparators, which, as their name implies, compare a measurement with a known standard and may, in some cases, be measuring machines also; (3) Optical Flats, and (4) Measuring Machines of the electro-mechanical or optical type. It will be the purpose of the first section of this series to take up these classes of instruments, explain them, show you how they work, and show you how to use them accurately and to best advantage in your daily affairs. The second section will take up their application to the inspection and calibration of both production and tool inspection instruments.

#### Part 1 — Gage Blocks

\*A micro-inch is one millionth of an inch (0.000001").

Because, as you have seen, all measurements are relative rather than exact, gage blocks are made generally today in two grades, "inspection" or "A" grade, accurate in height, flatness and parallelism to four micro-inches\* in an inch of length; and "production." or "B" grade, accurate to eight micro-inches. Until a short time ago, nearly

all manufacturers of these products also offered "laboratory" or "AA" grade blocks made to an accuracy of two micro-inches. Some manufacturers still offer this grade, altho the Bureau of Standards has asserted in circular LC-725, that the making of gage blocks to this accuracy is of little practical value. The reason, of course, is that gage blocks, the same as any other metal surface, wear a certain amount each time they are used.

We shall go more deeply into this matter of wear a little later in the discussion of the various metals of which gage blocks currently are manufactured. It is brought in here only to emphasize the importance of an adjunct to gage blocks that is a positive necessity to any user who expects to use the blocks, more or less regardless of the material in them, for truly accurate instrument inspection. This is the—

#### Inspection Certificate

Inspection certificates are offered or are available for any set of gage blocks made or in use. One of these is shown in Fig. 1. If the manufacturer does not include an inspection certificate with his set of blocks, one can be had at reasonable cost from him or the Bureau of Standards by sending in the set for calibration. This certificate lists each block in the set and gives its actual



Fig. 2—A set of steel gage blocks. These are calibrated metrically.

## Shortcut to Production

KEARNEY & TRECKER ROTARY HEAD MILLER COMPLETES
COMPLEX 3 PART DIE DIRECT FROM BLUEPRINT TO WORKPIECE
NO TEMPLETS OR MODELS REQUIRED



- Shows set-up of completed ejector half of die. Operations on die face completed in single set-up.
   Total set-up and machining time 69.4 hours.
- Set-up for cover half of die. Operations on die face completed in single set-up. Total set-up and machin-
- ing time 74.2 hours.
- Set-up for machining center insert part of die. Note deep narrow slots — end milled. Operations on die face completed in single set-up. Total time for setup and machining — 86.2 hours.



Bath sides of the finished horn ring for an automobile steering wheel — as it cames complete from the die being machined above.



DIRECT — ACCURATE — FAST — are the three factors that make the Kearney & Trecker Rotary Head Milling Machine so outstanding for toolroom, experimental, and manufacturing work. DIRECT—because it mills intricate shapes in a single set-up, transmitting blueprint dimensions direct to the work-piece without the aid of models or templets. ACCU-RATE—because there is exact control of all mechanical movements. FAST — because initial preparation and multiple set-ups are eliminated.

For complete information write for Catalog 1002C. Please give your business connection.

Kearney & Trecker corporation

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Fig. 3—A typical set of chrome plated blocks.

measurement as to size, flatness and parallelism to the nearest millionth place. That means, with the inspection certificate, the instrument inspector can add up the actual values to the nearest millionth in any set up of wrung blocks and determine how much he is over or under the nominal dimension of the combination. While gage blocks wrung together in large numbers have a tendency to "average" their individual plus or minus errors, it often occurs that a combination of often-used blocks will be short of the required total or that a combination of little used blocks will be on the plus side of the dimension sought. The inspection certificate answers any doubts there may be in the mind of the user on this point, but only so long as the inspection is recent or that little use of the blocks has been made since they were last inspected. This point, of course, applies especially to steel blocks and with considerably less force to those made of harder metals, as you will see a little later. Methods of checking your own gage blocks in your own laboratory, elimininating the necessity of factory or Bureau inspections will be given in detail in section II.

#### Metals for Gage Blocks

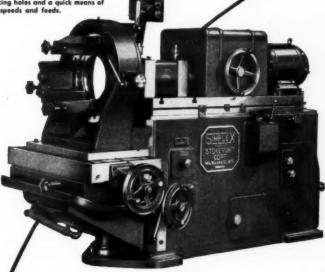
Gage blocks are offered by various

manufacturers in various materials. First and most common of these is a high carbon chromium steel alloy, usually held to a hardness of 65 Rockwell C or higher. A typical set of steel blocks is shown in Fig. 2. The blocks are alternately "drawn" (annealed) and frozen by deep freeze methods, often at 120 degrees below zero, to make the metal stable. The standard test for stability is to boil the test piece for 24 hours in a solution of potassium dichromate and water. If it changes in dimension more than two micro-inches to the inch of length, it is rejected. The Bureau of Standards has found unstabilized and improperly stabilized gage blocks that grew as much as 175 microinches in two hours. Unless the metal is stable, the block may grow in size for years.

Steel gage blocks are hardened before final sizing because if they are subjected to hardness tests after final sizing, the impact of the hardness tester will distort them. The annealing is done to relieve internal stresses and to fix the hardness of the metal; the alternate freezing and heating for stabilization. The blocks are ground and lapped to final size on lapping machines finer than those used by most opticians.

Next material in common use is the steel gage block with hard chrome The shop which builds a variety of products in varying size lots, needs semething much more flexible than the conventional type of precision baring machine. It must be able to handle jobs both large and small with a minimum of set-up and change-over time. It must be quickly aligned, equipped with an accurate method of spacing holes and a quick means of changing speeds and feeds.

# <u>SIMPLEX</u>



#### THE BORING MACHINE FOR A THOUSAND JOBS

A SIMPLEX 3U Knee Type Precision Boring Machine is here shown with an indexing fixture for precision boring several parts in a heavy transmission. The hole sizes differ, so a quick means of changing speed is of great advantage. Various fixtures are used which can be made of the most desired proportions and the machine adjusted to suit the work. Boring and facing feed changes are quickly and conveniently made by means of the star knobs on the bed. All controls are within the operator's easy reach. One of the most valueble features is the fact that when once set up for a job, operation is reduced to loading and unloading the work and pushing the starting button. Let our representative study your work and tell you more of the many advantages of these advanced designs.

# Precision Boring Machines

SIMPLEX Precision Boring Machines and Planer Type Milling Machines
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plated surfaces, a set of which is shown in Fig. 3. The chromium is deposited on the steel block, which usually is of the same composition as that previously described without chrome plating, to a sufficient thickness to allow final sizing and finishing on the lapping machine. This method also furnishes a convenient means of salvaging worn steel blocks. They simply are chrome plated and brought back to size. The chromium surface also is considerably harder and more wear resistant than the steel alloy.

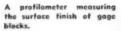
A third material which has come into use more recently than either the steel or the chrome plated steel blocks, is sintered tungsten carbide. A set is shown in Fig. 4. These are considerably more expensive than the steel or chrome plated blocks, because of the cost of the metal, but chiefly because of the extra work involved in sizing so hard a material. Their wear resistance, however, as will be seen later, is very great. In fact, before full sets of carbide blocks were available, many manufacturers were offering wear blocks of tungsten carbide to be used on the ends of wrung steel or chrome block combinations. particularly for production inspection where the blocks would get a great deal of use.

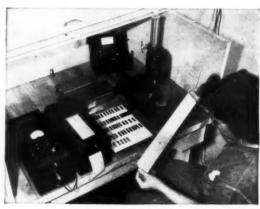
A fourth material, which in its application to gage blocks is even newer than the sintered tungsten caroide, is a carbide cast alloy of the cobalt-chromium-tungsten group. The thinner blocks of this type are made entirely of the alloy, while the larger ones have steel cores with the material fused onto the measuring surfaces, a method commonly known as "hard facing," (Unlike the sintered carbides, the cobalt-chromium-tungsten metals, often called "cast carbides," can be melted and are more easily machined; thus are much easier to handle in the manufacturing process.) A set of these blocks, hard faced with a cast carbide called "DoALLoy" is shown in Fig. 5.

#### Sales Arguments

While it is not the province of this series to enter into any competitive selling arguments, it does seem necessary to point out a few facts. The assertion of the makers of steel gage blocks long has been that only steel should be used for gage blocks because steel is the material most likely to be measured and the thermal expansion rates of the work material and the measuring material should be as nearly the same as practicable.

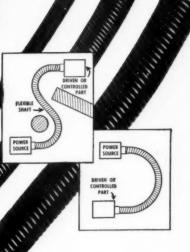
This may be a valid consideration for the production inspector whose work may be done under all sorts of conditions of temperature and humidity. But for the inspector of precision tools it





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Fig. 4-A typical set of tungsten carbide blocks.

does not hold, because his work should be done if possible under "standard" conditions:—a temperature of 68°F or 20°C and a constant humidity. Certainly the work material and the gage blocks should be at the same temperature in any case. It might also be pointed out that a high carbon chrome steel, such as is generally used for gage blocks, has by no means the same thermal expansion rate as the more common steels the inspector is most likely to be measuring.

The statement is often made, usually by those who do not offer them, that chrome plated blocks do not wring well. It is true that chromium is one of the "slick" metals and may not wring as well as a properly finished steel surface. Yet chrome plated blocks wring well enough to suit all practical purposes, and wringability, with all the special gaging holders and accessories available today, is largely used for showmanship anyway.

The carbide block manufacturers talk mostly about the wearing qualities of their products and it is true that the wear on carbide blocks, whether sintered or cast, indeed is slight. Yet, it must be said that with proper inspection and with some record of use of the steel block, its accuracy can be maintained to all practical purposes. So far as the cost of the carbide block as against the first cost of the steel block and the cost of the calibrations and inspections it is likely to require during

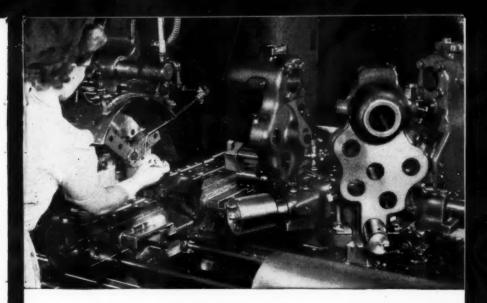
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 Where you have a part like this, requiring as many as six operations in one chucking, you have an ideal job for the Fastermatic.

Here, for example, the machining of gear blanks calls for a series of rough and finish turning, facing, and boring operations which formerly required eight minutes per part. With the Fastermatic, all these cuts are handled with the advantage of a completely automatic machining cycle. Time was reduced to only two minutes per part—a saving of 75%. And costs were reduced by 14 cents per piece.

The ability to handle a large number of operations in one chucking and require but little of the operator beyond loading and unloading the work, makes the Fastermatic a most profitable

investment in low-cost production. Write for literature.



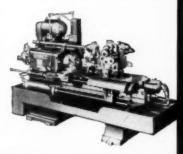
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On these gear blanks, six operations are completed in 10; seconds, actual cutting time. Floor-to-floor time is 125 seconds



The Fastermatic is a universal automatic turret lathe for both high and low production machining, it is equipped with a hydraulic feed system, automatically controlled by standard feed cams.



Fig. 5—A set of "Lifetime" gage blocks hard faced with DoAlloy cast carbide.

its useful life are concerned, they probably are about even. The sintered carbide blocks of the USA (oblong) type however, are quite brittle and require great care in their handling.

Thus, in the last analysis, most of the sales talk can be disregarded. The inspector is safe and warranted in choosing whatever kind of block, made of whatever material, he happens to prefer. Each has its good points, and like any other product, its drawbacks.

#### Surface Finish

Before a gage block goes out to the user, it goes thru at least four different inspections at the factory. At least eight different specifications must be maintained to the manufacturer's standard:—size, flatness, parallelism, stability,

wearing qualities, hardness, general workmanship, and surface finish. Size, flatness, parallelism, stability, and hardness are of prime importance. Wearing qualities, as you will see shortly, depend a great deal on hardness and surface finish. Surface finish also determines, in large measure, accuracy and wringability.

The Bureau of Standards requires that an A-grade block have a surface finish of not more than one RMS\*

micro-inch. Most gage block manufac-



## No. 101 CENTERLESS FEED POLISHING MACHINE

Gives any grade of finish to cylindrical work. Polishing wheel mount is beavy, with triple V-belt drive. Wheels can be trued in motion. Feeding speed is variable, the work support being adjustable with the feed unit. All parts are guarded but accessible. Construction is rigid and durable.

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<sup>\*</sup>RMS means "root-mean-square" and is the mean of "hills" and "valleys" found in the profile of the surface under study, arrived at by rather a complicated measuring process. The "root-mean-square" of a surface is measured in millionths of an inch.

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#### How Staples can help you offset them with properly designed tools

To help offset today's higher wage rates, industry faces the need for higher output per man-hour—a continuous flow of good pieces right on down the production line.

Staples Carboloy-tipped Circular Cutting Tools, with their cemented carbide cutting edges, are the answer to today's problems of higher speeds, heavier cuts and greater precision. Staples Tools—with the hardest cutting edges known to industrial machining—mean less time out for resharpening, fewer visits to the toolroom, less down time on the line. And they give greater accuracy over longer periods of use.

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July. 1946

MACHINE TOOL BLUE BOOK

143

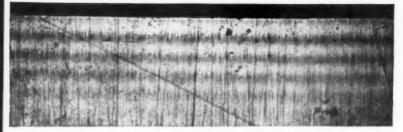


Fig. 6—A typical gage block surface, magnified 100 times.
A set of "Carblox" wear blocks of the Hoke type.

turers hold their RMS tolerances to less than half the bureau's limit. A typical steel gage block surface, magnified 100 times, is shown in Fig. 6. Analysis under a Profilometer, a device for measuring surface finish in RMS units, shows that this surface has a finish of slightly more than .2 of an RMS micro-inch. In decimal form the exact figure was 0.00000021 RMS inch. (The regular dark fringes that show in the photo are light wave interference bands.)

It has been proved experimentally many times that the ability of one gage block to adhere to another at greater than atmospheric pressure (wringability) is proportional with most materials, in great degree to the fineness of its surface finish. Gage blocks are wrung together not, as most instrument salesmen seem to feel, to astonish the onlooker with what appears to be a defiance of gravity and other physical laws, nor to support 200 pound weights, but to exclude any air, oil, or other

foreign matter that may be sticking to the surface of the blocks. Thus a wellwrung stack of blocks will measure more nearly to the desired minimum total than will a stack in which the blocks are merely set one on top of the other. This matter will be taken up in greater detail in later sections, particularly in the section on comparators with high magnifications, and in the studies of light wave measurements.

#### Wear of Blocks

The wearing qualities of the block also are dependent to a considerable degree on the hardness and the surface finish. The effect of the latter on wear was tested by F. H. Holt of the National Physical Laboratory. He took two sets of eight steel blocks, one set finished as coarsely as it could be and still wring, and the other finished to the usual fineness of about 2 RMS micro-inch. All had been hardened to the same degree by the same methods. The blocks of



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each set were wrung together 200 times.

The eight finely finished gages wore a combined total of 14 millionths of an inch during the first 100 wrings, or an average of 0.0000014" per wring. Wear was found to cease, so far as it could be measured, after the first 100 wrings.

The coarsely finished blocks wore 42 millionths of an inch in 200 wrings and were still wearing when the test stopped.

The average wear of each fine gage, in 100 wrings, was two millionths of an inch, or 0.0000002" per wring, while the average wear per coarse block, after 200 wrings, was five millionths, or 0.000-000025" per wring.

The test indicates, however, that there are other variables beside surface finish and hardness, and that wear tends to become so slight as to be unmeasurable after a certain number of wrings. It is unfortunate that no equation representing the known facts, at least, has been given. Such as equation would save a great deal of time in toolrooms and much argument and expense.

Another test, conducted by a manufacturer, showed 60 millionths of an inch wear in steel blocks wrung 15,000 times. No data were given as to the number of blocks used in the test, nor as to the surface finish of the blocks when the test began.

It should be noted again, also, that the tests cited were made on steel blocks of the usual high carbon chrome composition. Furthermore these blocks were of the USA or oblong type. Makers of "square" or cubic blocks assert their tests show their blocks wear only 17 millionths of an inch throughout their useful life, but unfortunately do not say what comprises a "useful life."

The wearing qualities of chromeplated blocks are conservatively estimated by most authorities at three times or more those of the SAE 52100 steel blocks Manufacturers of sintered carbide blocks assert their products will wear 50 to 100 times longer than steel blocks. The lower figure probably is too conservative, for tests on blocks faced with cast carbides have

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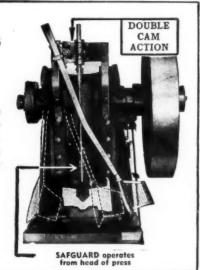
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Safety Engineers

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shown their wearing qualities to be some 60 times greater than steel and 20 times greater than chrome.

It should be noted that the greatest wear in any gage block combination arises from abrasion on the measuring surfaces of the two end blocks. Wear blocks of cast or sintered carbide, then, if the dimension is large enough to allow for their use, are to be recommended if steel blocks are used.

The "standard" set of gage blocks consists of 81 pieces, altho 83, including two carbide wear blocks, may be of-fered as a "standard" set. No attempt will be made to catalog the individual blocks by size, nor will any rules be given for the care and handling of the blocks, for it is assumed that readers of this work are familiar with the instruments at least to the degree that no directions for wringing or care are required here.

(The next installment will consider the building of dimensions with gage blocks, gage block accessories, and their uses for direct measurements.)

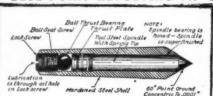
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This is a rigid, high-speed unit embodying all of the features essential to modern milling practices. Popular demand has made it a standard item which thousands of tool and die makers, and production plants find a practical necessity.

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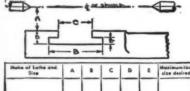
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Model

41/2-5



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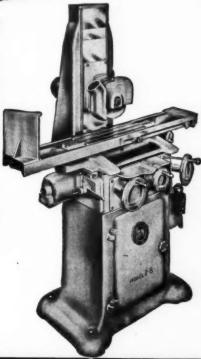
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## PART IV. — SPECIAL TYPES AND EQUIPMENT By JOHN E. HYLER

O BVIOUSLY, it is impossible in a short series of articles on turret lathes and turret lathe practice, to set forth the advantages of different machine models. Different arrangements of

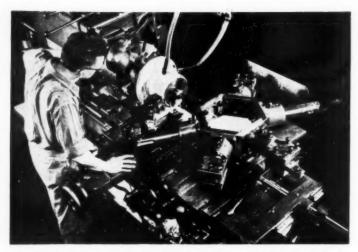
geared headstocks, for instance, have

Operator here is preselecting the next feed while lathe is in operation. These single lever direct reading speed and feed controls are a distinct contribution to smooth, speedy operation, eliminating waste motions. (Jones & Lamson photo.)



July, 1946

MACHINE TOOL BLUE BOOK



HALVING PRODUCTION TIME—With this set-up, using a 2-L unit with cross-feeding hexagon turret and Gisholt standard tools, it is possible to produce two of these wheel hubs in the same amount of time previously required to machine one hub. (Gisholt Machine Co. photo.)

been mentioned, but until now nothing has been said of a line of Gisholt turret lathes equipped with geared headstocks providing highspeed and lowspeed ranges with provision for instant change from one range to the other, without shifting a gear. This is accomplished by means of multiple disc clutches, between the high and the low ranges of spindle speeds. Such equipment often is convenient where succeeding operations call for high and for low speeds, as in some cases of turning and then threading, boring and then reaming, drilling and then tapping, etc. The quick change can be made from the high speed range to the low, or vice versa, as the occasion may demand. It is also possible to fit many of the turret lathes in this line with special hydraulic speed selectors. Simply turning one dial type control effects the desired speed change by power, without stopping the spindle, or releasing the main drive clutch.

Neither should it be overlooked that

a highly developed line of machines, generally referred to as automatic chucking and turning machines, are in reality turret lathes, designed for high production on chucking work. Made by Potter & Johnson, this line of machines does not include any of the bar type. Particular attention has been given to incorporation of automatic speed changes for the spindles, and also automatic feed changes. The feed and speed changes are arranged in different groups, so that the best-adapted group may be selected, and put into use for any given job. I cannot give this layout the consideration it deserves, but an idea can be gained by citing the spindle speed changes on only one model. This particular machine is provided with 20 changes of spindle speeds, between 16 and 304 rpm. These 20 speeds are arranged in five sets of four automatic changes. Any desired group of four automatic changes may be quickly obtained, by using the proper set of hand



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pick-off gears, located in a compartment provided for them, at the end of the headstock.



Details of wheel hubs produced twice as fast with the Gisholt set-up and tooling shown in the preceding illustration.

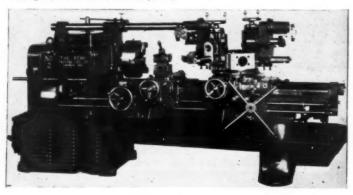
A very interesting thing concerning this line of chucking type turret lathes is that it includes certain models having two spindles, arranged in parallel, and operating side-by-side, so that two pieces of work are machined at once. The hexagon turret for this machine, which is of saddle type, is made extra large, and each turret face is equipped with two tool stations, so that two tools can be mounted on any side of the

turret, to perform operations on both pieces of work as the turret advances. Machines of this kind are obviously not suitable for use in shops where frequent changeovers from one job to another are encountered. They are indicated, rather, for very large runs of work. The workpieces in both chucks may be alike, or they may be entirely different, however, as may be best in individual shops using such machines. The ability to produce two different types of work on the same machine at the same time is an interesting proposition, and very often a profitable one.

#### **Tooling and Control**

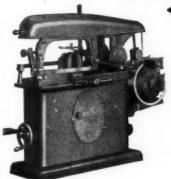
The proposition of proper tooling, in some cases, ties in with that of advanced methods of control. Many outstanding things have been done on different turret lathes by means of special tooling. While there are various cases where development of special tools is of great importance, one should never turn his attention to the development of special tooling layouts for turret lathes, until he has first fully satisfied himself that standard tooling will not accomplish the work advantageously. Inability of a given machine to perform a given job

The universal turret lathe shown has a round bar capacity of  $3\frac{1}{2}$ " and is fitted with an overhead pilot bar, supported at two different points on headstock. Lead screw thread chasing attachment with split nut brackets and threading dials on both carriages. (Acme Machine Tool Co. photo.)



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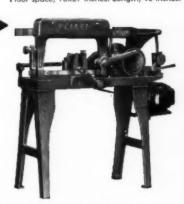
#### SPECIFICATIONS:

Capacity, 63/4 x 63/4 inches.
Vise swivels to 45 degrees.
Capacity at 45 degrees, 4 inches.
With automatic safety stop switch.
With feed control.
With foot lift to saw frame.
Automatic lift on reverse stroke.
With coolant tank and pump.
Length of blade, 12 to 14 inches.
Two speeds available, by shifting belts.
100 to 168 strokes per minute.
1/2 H.P., AC, 1,725 R.P.M. motor.
Height from floor to top of vise, 221/2 inches.
Weight complete with motor, 580 pounds.
Weight complete crated, 634 pounds.
Floor space, 13x27 inches. Length, 40 inches.

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Capacity, 63/4 x 63/4 inches.
Vise swivels to 45 degrees.
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Length of blade, 12 to 14 inches.
Standard power blades used.
Two speeds available, by shifting belts.
70-125 strokes per minute.
Automatic lift on reverse stroke 1/4 H.P., AC, 1,750 R.P.M. motor.
Height from floor to top of vise, 25 inches.
Weight complete with motor, 275 pounds.
Weight complete crated, 325 pounds.
Floor space, 13 x 27 inches.
Total length, 40 inches.



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This universal turret lathe is taking combined cuts on a gear blank, cutting from the square turret and the main hexagon turret at the same time. (Warner & Swasey photo.)

to really high advantage may be due to a lack of properly selected, standard tools. The efficiency of the job depends on how the tooling is planned in nearly every instance. If the operator is handicapped, by not having enough standard tools of the right kinds for the work encountered, this situation should be remedied fully, before any thought is given to special tooling. Several prominent manufacturers offer some very versatile tooling equipment.

One aspect of special tooling that is

One aspect of special tooling that is often not considered, is the possibility that changes may be made in the products. Engineering changes develop with startling rapidity in some lines of products. Before developing and making highly expensive tools for machining given parts on the turret lathes, the engineering departments certainly should be consulted, at least to determine whether any changes on the parts are contemplated. The special tool, in this respect, is in the same category with the special machine. It can very easily become a "white elephant," when changes are made.

Every possible means of providing highly rigid tooling for turret lathes should be employed. This naturally Preselecting spindle speed for the next cut while this turret lathe is in operation. (Jones & Lamson photo.)





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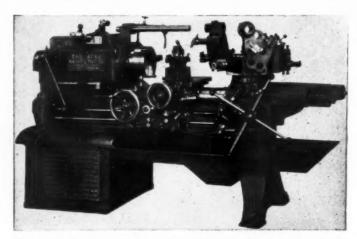
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This turret lathe has a round bar capacity of 2-9/16". However, it is tooled for chucked work. Note the large multiple turning heads held in the turret and observe that they incorporate a sleeve which engages and slides over the overhead pilot bar, held in a bracket arising from the headstock. Pilot bar enters sleeve before the turning tools engage the work thus providing added rigidity. (Acme Mackine Tool photo.)

contemplates that the turret lathes themselves must be in good condition, as well as the tool mountings. If machines are not giving the service they should, they must be overhauled or rebuilt. In the matter of time-saving, where standard tools are being employed, it is important to use multiple cuts wherever consistently possible, and also combined cuts. Multiple cutting, as it is generally understood, consists of taking more than one cut from the same tooling station, and in consequence reduces the distance each of the tools must travel. Combined cutting has reference to making a cut or cuts from the main hexagon turret, and from the cross slide, at the same time. One very important part of tool planning is careful consideration of what cuts, if any, can be taken at the same time in this manner, without interference, and in crowding just as much of this combined and multiple cutting into a given job as possible, in order to reduce overall cutting time.

Rigidity is increased in any setups where the work is exceptionally heavy, by using pilot bars wherever possible. Center pilot bars are used where very heavy boring cuts are to be taken. To impart added rigidity to heads turning on sizable outside diameters, overhead pilot bars are used. Where pilot bars are in use, these slide thru sleeves in the turrets, or in the turning heads, in such manner that the turrets are temporarily (while the tool is actually in the cut) connected with the headstock. The result is that the rigidity inherent in both head and turret combine to resist any deflection that otherwise would be caused by the thrust of the work against the cutters.

#### **Special Controls**

On most types of cuts taken with turret lathes, maintenance of given rates of tool feeds and maintenance of given spindle speeds results in constant cutting speeds. There is one type of cut.

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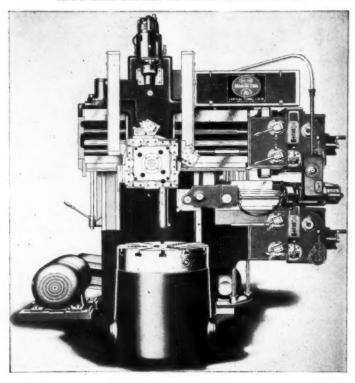
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however, to which this is not applicable. That is a facing or a similar cut, where the tool begins cutting at the outer circumference, and feeds toward the center. Then, the cutting speed constantly decreases, while the spindle speed and the tool feed remain constant. This is not of great consequence on work of relatively small diameter, but on jobs where the diameter is large, it may result in the loss of considerable time. It seems that work of very large diameter is more often encountered on vertical turret lathes than on horizontal machines, tho some of the larger horizontals also handle work that is quite large.

It is interesting to observe that for jobs where work of this type is handled in quantity, some have adopted special controls, which increase the speed of the motor on vertical turret lathes, as the side cutting tool feeds in toward the center This is accomplished by gearing rheostats to the tool slides. The increase of motor speed as a result of this expedient, as the tool proceeds inward. maintains a predetermined cutting speed, and materially shortens the time required for the tool to cover the required scope of travel. One firm making this control, it is believed, will apply it to different machine tools, to the speci-

Bullard vertical turret lathe with Man-Au-Trol automatic control.





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FLEXIBLE SHAFT EQUIPMENT

Here is a W & S multiple cutter turner at work, turning two concentric diameters at the same time on a ram type turret lathe. On top of the headstock can be noted the Preselector, a device which permits selection in advance of any of the 12 speeds provided by the headstock while machine is cutting, so shift can be made with the single lever at the proper time. (Warner & Swasey photo.)



fications of the customer. This is the Electric Controller & Mfg. Co., Cleveland.

An interesting and versatile automatic control has been developed by the Bullard Co., manufacturers of vertical tureret lathes. It was used with great success in war production, and without doubt will find many further applications in the days ahead.

Considering use of this type of control in connection with a vertical turret lathe, one simply takes any piece of work the machine is capable of handling, and sets it into the chuck properly. Then, the various tools are brought manually thru each necessary cut, and at the completion of each respective cut, a simple setting is made, relative to the automatic control. When all operations have been completed in this manner, and all the functional stops relating to the control have been set, the turret lathe is thrown into automatic operation, and thereupon, becomes 100% automatic. This automatic equipment on the machine in no way prevents it from being operated manually on small runs, where automatic operation would not be an advantage. Changing from automatic to manual operation is accomplished by a single lever, which is attached to the control mechanism.

I have mentioned the operating economy obtained by using standard tools to the fullest possible extent, as a matter of reducing tool costs. In connection with use of the automatic control just cited, it is interesting to note that tooling often may be more simple. and that a smaller number of tools will be needed, in most cases, Several different tools sometimes can be placed on one face of the turret, and brought to the cut, either simultaneously or one after the other, by the automatic control mechanism. A very interesting point is that in some cases, the same tool may be used for several different cuts, thus greatly reducing tool costs. A single boring tool, for example, may be used to bore different diameters, one after the other. It is claimed that a machine fitted with this type of control usually requires not more than half the tools to machine a part, that are required on other automatic machines.



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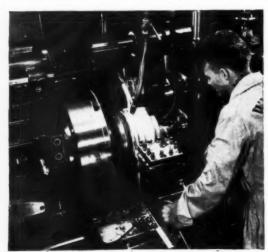
What has been said with regard to the advantages of standard tooling and simplified tooling for turret lathes must not be taken by relatively new operators to mean that special tools are to be avoided where their use is plainly and definitely advantageous. The man responsible for turret lathe tooling certainly should be acquainted with all standard tools, know their possibilities, and should make sure a given part cannot be machined to high advantage with them, before turning to special tools, However, it is to be remembered that extremely high quantities of given parts being run may justify development and use of special tools, even tho the advantages gained on each piece may be small. It will add up on consecutive pieces until the cost of the tooling is entirely off-set, and will thereafter show a saving.

Also, there are instances where development and use of special tools is inevitable, if the work is to be performed in the turret lathe to any advantage at all. Different tools have been devised for instance, for generating

spherical cuts, which could not have been machined with standard tooling. There are some plants of large size which have tool engineers, capable of developing and applying special tooling of various kinds, but in most instances, tools of this kind are developed by the engineering departments of the turret lathe manufacturers. Always, the manufacturers of turret lathes serve as comprehensive sources of information as to what has already been done, and is being done, in the matter of special tooling.

There have been various instances where turret lathes have practically been built around an out-of-the-ord-inary piece of work to be performed. One instance of this kind comes to mind, in which the Gisholt Co., actually built a hydraulic pressure unit into a horizontal turret lathe. The pressure unit, mounted at the end of the bed, was capable of exerting a pressure of around 15 tons.

The occasion for building this pressure unit into a turret lathe was the necessity for pressing and rolling brass



Combined and multiple cuts are both being taken on a steel forging job, on the heavy duty turret lathe shown. Machines of this particular type are made in very large bar capacities, some of them handling 8, 9 and 12" bars. (Warner & Swasey photo.)





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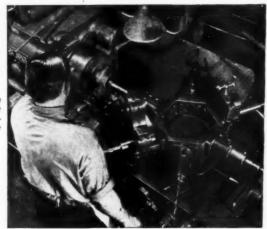


Hand Cut

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HAND CUT AND GROUND-FOR EVERY PURPOSE





Machining a magneto drive body on a Gisholt turret lathe with fixed center hexagon turret and three-jaw scroll chuck.

rings into place over dovetailed seats, which the turret lathe had machined for the purpose. The job proper was a valve disc. The disc was gripped in an air-operated chuck, with which the spindle of the machine was fitted, taking a facing cut, and turning an undercut or dovetailed groove, into the disc proper. The brass ring applied, has an annular projection, which is rolled into the undercut groove in the valve disc, under pressure.

A special head, having two rollers for rolling these rings into place under pressure, was mounted on one of the hexagon turret faces. The turret guides this roller-head to the work, while the hydraulic ram delivers the necessary pressure from behind, to force the brass ring solidly into place. The hydraulic ram then retreats, and the balance of

the turret lathe work proceeds, the applied brass ring being faced and the valve disc completed in the same chucking.

It is highly evident that the turret lathe, indispensable for many years on so many types of work, is keeping step with machine design in general, and will continue to keep step. No pretense is made that this short series of articles has done more than to touch upon the subject. There are excellent lines of turret lathes of which no specific mention has been made, and there are some important phases of turret lathe practice that have not even been considered. It is hoped, however, that what has been said will at least broaden the conception of some, whose turret lathe experience may have been either moderate or limited.

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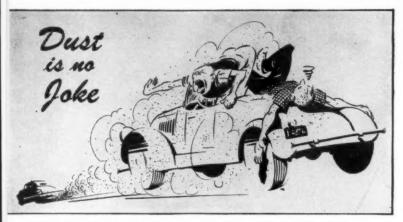
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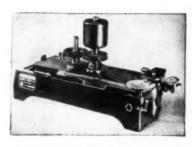
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Throws a magnified image of an actual part against an enlarged master drawing, instantly showing if part is inaccurate, and how much. Permits control of a production job from start to finish — insures correctness of tool forms, checking of gages, correctness of tool adjustment at start of production, spot inspection to detect tool wear as work progresses. With the Wilder Projector, the lost piece on the run as well as the first, will be well within tolerance limits. Operation of the Wilder is so quick and simple that many shops use it for 100% inspection. Priced within budget of any shop. Write for the bulletin.



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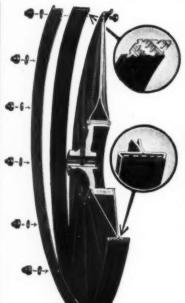
A RECORDING ATTACHMENT using 4" diameter waxed paper discs (no ink or liquids) can be furnished for reference should complaints arise after gears are installed. Often a gear is unjustly blamed when the wrong center distances in the housing, poor bearings, etc., may be the cause. PARKSON GEAR TESTERS are furnished in ten sizes for gears from 1/4" to 36" center distances. Write for full details.

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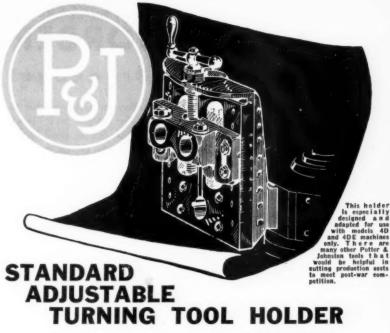
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# Selecting Grinding Wheels

By JOHN F. FISCHER\*

In an article that appeared on page 137 in the January issue, "Manipulating a Grinding Wheel to Alter Its Grinding Action," we told how a wheel that is not exactly suited to a job can sometimes be "babied" so that it will do a fairly good job of grinding. Such manipulation is most effective in making a wheel act harder or softer than its actual grade. Not so much can be done with a wheel that is of the wrong grit or structure. And we emphasized that if a wheel is made of the wrong abrasive or bond, it is usually necessary to get another wheel.

High production shops usually go to considerable pains to settle upon exactly the right wheel specification for each of their long-run jobs, for they find that such careful selection pays both in cost and in quality of output. So-called "job shops," especially small ones and those which have a diversity of small lots, seldom feel that they can carry large enough inventories of wheels to insure that they will always have on hand a wheel that can be relied upon to do a satisfactory job at reasonable cost, even with skillful manipulation. Lack of basic knowledge of wheel action and characteristics often aggrevate this condition.

For instance: After a long period of satisfactory dealings with us, a fairly small job shop lodged a serious complaint that our wheels had of late been giving very short life. The shop of course assumed that the quality of our wheels had fallen off. We knew that wasn't so.

One of our abrasive engineers went out to spot the trouble. It turned out to be one that crops up quite often. The wrong abrasive was being used. In the effort to keep wheel inventories low, the shop had settled on what it thought would be a "general purpose" wheel. Strictly speaking, there is no such thing. But considering the type of work the shop ordinarily did, the selection was intelligent.

Because the shop's grinding had in the past been almost entirely on grey iron castings, the choice had quite correctly fallen on silicon carbide as the abrasive. Silicon carbide crystals fracture quite easily and since cast iron is low in tensile strength, the grains which were quickly dulled by the hard iron were kept sharp by fracturing at just the right time. The balance between crystal strength and the tensile strength of the cast iron was perfect, so the wheels gave satisfactory life.

The trouble the shop complained of came when the silicon carbide wheels were used to grind a good-sized lot of steel castings—a type of material the shop had little or no experience with.

Steel castings are tough—of high tensile strength. The comparatively weak silicon carbide crystals were therefore broken down long before they had dulled—while they still had a lot of useful life left.

These steel castings should have been ground with aluminum oxide wheels, for aluminum oxide crystals are tough enough to stand the stresses set up by tough materials, and so do not break until they should—namely when they have dulled.

By making the change in abrasives, the shop got satisfactory life from the wheels used on steel.

It should be stressed that the abrasive we substituted in this case was what is known as "regular" aluminum oxide. Both aluminum oxide and silicon carbide can be made to have variously altered characteristics by slightly altering the manufacturing operations. The characteristics of an abrasive are its

<sup>\*</sup>Manager, Sales Engineering, Simonds Abrasive Company.

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hardness, that is, its ability to penetrate or cut other materials; its toughness, or resistance of the crystals to breaking under stress of grinding action; shape of the grains, whether roughly cubeshaped or elongated; and nature of the fracture, which concerns the condition of the cutting surfaces and points after We have seen that regular aluminum oxide is tough and not easily fractured. Regular silicon carbide is weaker, but harder.

For use in grinding wheels several types of aluminum oxide are available. In general, regular aluminum oxide should be chosen for grinding such tough materials as carbon, alloy and high - speed steels; wrought and annealed malleable iron; and tough bronze.

Aluminum oxide can also be treated to make it more friable, or easily fractured, than the regular type. This abrasive is especially suitable for tool room grinding, for it gives a cool cutting action similar to that of silicon carbide, while still being strong enough to withstand the stresses set up by the tougher tool materials.

This friable aluminum oxide is also often used for taking fine finishing cuts on tough materials-cuts so light that the crystals of a regular aluminum oxide wheel would not break quickly enough to provide the sharp edges needed for the desired free-cutting action

If the area of contact between wheel and work is especially large, a special friable aluminum oxide may be preferable on work that if it presented a normal area of contact would be ground with regular aluminum oxide. This, because the large area of contact might reduce the stress per unit of area to a point where the crystals of regular abrasive would not fracture soon enough to keep presenting sharp cutting edges. Instances would be certain kinds of internal and surface grinding.

Beside the regular silicon carbide which is naturally friable and suited for a wide variety of common jobs such as grinding cast iron, and the softer materials such as aluminum, copper and brass, silicon carbide abrasive can be



YES SIR, put one of these Etico-Emrick Tapping Attachments on the spindle of your drill press and you've got a combination that's tops for fast, accurate tapping—with maximum protection against tap breakage and work spoilage. With an Etico-Emrick Tapping Attachment you can get all the extra tapping capacity you need at minimum tool cost.

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had in a tougher type which is used for coarse grit snagging, in a more friable type which is suited for grinding such tool materials as the cemented carbides where the cutting action must be cool; and specially treated for resinoid bonding.

It is to be noted that silicon carbide is used for very hard materials on the one hand, and very soft ones on the other. The reason for this seeming contradiction is this. It is used for hard materials because it is harder than any material it may be called upon to grind and fractures so readily that it will keep presenting sharp edges to the work. It is used for grinding very soft materials because it is so friable that even the low stresses set up by soft materials will break the crystals, whereas aluminum oxide would not be broken by them and the crystals would keep right on rubbing, but not cutting, after they became dull.

In the article, "Your Grinding Wheels -Right or Wrong?," which appeared in the December 1945 issue, we discussed the use of wheels made up of various "special" combinations of abrasive grain sizes, and pointed out that very often standard wheels would serve as well or better than specials.

It pays to have a clear understanding of what determines grain size. There is a lot more to it than the general impression that we should use coarse grit for heavy stock removal, and fine grit on light finish cuts for fine surface quality. Both are true-with exceptions.

Thus, large size grains are effective in removing large amounts of material —if the material is comparatively soft for the large grains take large chips. But on hard materials, the large grains do not penetrate sufficiently to dig out large chips. Small grains penetrate hard materials much better. Therefore, although each small grain will produce smaller chips, there are so many more of them per unit of area that the small grit wheel will in the end remove more material in a unit of time, and so is the better material remover.

Other things being equal it is usually best to use fine grits for fine finish and great accuracy. But in some shops it

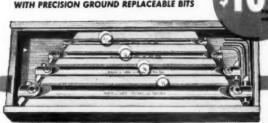


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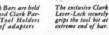
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10039 Marcus Ave. Detroit, Mich. is necessary to take both a heavy roughing cut, and a fine finishing cut on a single machine. If the lots are small, the time taken for changing from a coarse grit wheel to a fine grit one, would run unit grinding costs up considerably. A skillful wheel manipulator can by carefully dressing a coarse wheel make it give surface qualities and accuracy comparable to what the ordinary operator would get from a fine grit wheel. If small lots are the rule, it usually pays to give a grinding operator training in such use of the dressing tool.

Wheels are made of various "structures"-which refers to the spacing of the grains. So-called open structure or porous wheels have wide spacing, with comparatively large voids between grains Such wheels are especially useful in grinding soft, ductile materials, since widely separated grains can penetrate deeply and so remove large chips, while the large spaces give adequate clearance for the larger chips. Open structure wheels are also advisable in operations where pressures are apt to vary, as in snagging, and some types of surface grinding, because wide spacing of grains forces each grain to carry its share of the pressure and so do its share of the grinding.

As we saw when discussing grain size, it is desirable when grinding hard materials to have as many grains in contact with the work as possible. This can be achieved by using wheels of dense structure with the grains closely spaced. However, very hard materials such as the cemented carbides dull the grains so rapidly that it is desirable for them to be released by the band quite quickly. One way to accomplish this is to use wheels of open spacing.

Close grain spacing is usually desirable when aiming at a fine smooth finish, and when using formed wheels whose shape is apt to be deformed by grinding, or when it is essential that a wheel hold its corner.

Nearly as basically important as selecting the right abrasive material, is selecting the bond type. Here we have a choice between vitrified, resinoid, shellac, silicate and rubber By far the larger number of wheels used in ma-



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## **ECKINGER**

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chine shops are vitrified, while the majority of resinoid wheels are used in foundries for snagging and cutting off operations. Shellac bonded wheels are strong and elastic. They are used chiefly for light material removal, such as in certain kinds of cut-off work, for sharpening knives and saws, and for finishing hardened steel rolls. Silicate bonded wheels release the abrasive grains easily and so are used chiefly for such operations as grinding edged tools where heating must be kept at a minimum. Also, silicate bond is used for very large wheels, because of manufacturing difficulties in making very large wheels in the other bonds.

Of widest use in machine shops is the vitrified bonded wheel. It is available with both aluminum oxide and silicon carbide abrasive and in a wide variety of grades, grain size and structure. Vitrified bond is unaffected by heat, water or oil, and since it can be closely controlled in manufacturing it is easy to duplicate any wheel that has been found to be exactly suited to a job.

Vitrified wheels can be used for either heavy material removal or light cuts for fine finish and accuracy. While they are strong enough for heavy work, they are not suitable for use in cutting off, since they do not stand heavy sideways pressure well. They are limited to about 6,500 s.f.p.m. in speed.

Resinoid bond wheels are stronger than vitrified, and so can be operated at speeds as high as 9,500 s f.p.m., which gives them a high material removing ability. This, and their great strength, makes them especially suited for low cost performance in foundry snagging and steel mill billet grinding. They have long life under strenuous use.

Because of their strength and comparative resilience, resinoid bond is used where the wheel is apt to be subjected to severe lateral pressure, and in the very thin wheels used for cutting off. For the latter operation they can be operated at speeds up to 16,000 s.f. p.m. on certain machines. Other uses for resinoid wheels are in cam grinding. finishing operations of various sorts, saw gumming or sharpening, and grinding aluminum.



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Rubber bonded wheels—which are not made by all wheel manufacturers are similar in characteristics and use to resinoid wheels. Their chief use is on jobs where an exceptionally high quality of finish is required.

In the previous article, "Manipulating a Grinding Wheel to Alter Its Grinding Action," we showed how a wheel of given grade can be made to act either harder or softer than it actually is. That is very important, especially in the smaller job shops. However, in any shop the best grinding results will be secured if the wheels are selected as to grade with their greatest probable use in mind. That requires knowledge of some simple basic considerations which govern grade selection.

The grade of a wheel is the trade way of expressing the tenacity with which the bond holds the abrasive particles. They can be pulled out of the bond readily in a wheel of soft grade, while a hard grade will hold them much longer. There are around 20 grades of wheels commonly made in vitrified and resinoid bonds by most wheel makers.

While nothing but actual experiment under shop operating conditions can be relied upon to determine the best grade to use for any job, the following governing factors should be kept in mind.

1—The physical properties of the work material. For soft materials, use a wheel of hard grade, because the grains will dull slowly and it is therefore not necessary to pull them from the bond rapidly in order to present fresh, sharp grains to the work. For hard materials, use a softer grade of wheel because the grains dull quickly and should be released as soon as they become dull.

2—Area of contact between wheel and work. A large area of contact makes the pressure per unit of area small, and the grains will dull before they are pulled out, unless the grade is soft. The high unit pressure which result from a small area of contact require a hard grade, otherwise the grains will pull out before they are dulled.



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3—Type and condition of grinding machine. A heavy, rigid machine in good condition can use comparatively soft wheels. Harder grades are required for light machines, or those which vibrate, have loose spindles or are otherwise in poor condition.

4-Ratio of work speed to wheel speed. The effect of this was discussed in the article, "Manipulating a Grinding Wheel to Alter Its Grinding Action. This factor permits of the greatest variation in manipulating a wheel's action to alter its grade action. In brief, the higher the work speed/wheel speed ratio, the harder the grade, and vice versa. On long run, mass production work where the ratio will presumably remain constant throughout a run, this should be taken into consideration carefully in selecting a wheel for each job. In shops doing a job lot business, more must be left to manipulation.

It must be emphasized that such general rules as we have given here are of little value in selecting a wheel for any specific job. Advice of abrasive engineers, reference to tables of wheel recommendations, and actual shop tests are the only safe guides. But the "reasons why" given here should make it possible for shop men to determine why a wheel—especially a so-called "general purpose" wheel—may not give the results desired on a specific job. And, within rather broad limits they should help in making the first tentative selection of a wheel for a new job.

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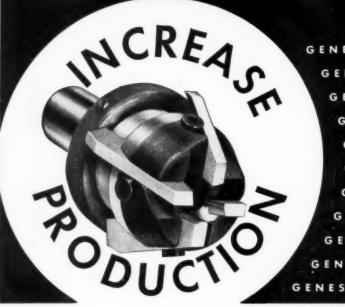
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## **AUTOMATIC PRESS ACTION**

By John E. Hyler

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July, 1946





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CHANDLER DUPLEX BORING AND FACING TOOL HEAD either one of which will feed any amount from zero to its upper limit. One has a maximum feed of 2" for each stroke of the press. The other will feed as much as 4". This type of feed is easy and quick to set up, and for that reason has been found very economical on relatively short runs. Obviously, however, any automatic feed for a punch press makes its best showing where long runs are being handled.

Automatic feeds for the punch press in most cases have reference to feeding coiled strip, and in about all cases, this material is held on reel stands, or some other device that will allow ready unrolling and feeding of the stock. There are different manufacturers of reels or reel stands for this purpose. Some of them center the stock automatically, so it will be held in revolving balance, and the coil will therefore revolve with ease at all points. On very heavy coil stock, however, supporting the coil from the center of rotation is not so easy. In some instances, special strip stock reels, designed for unwinding heavy coils for delivery to roll feeds on presses, support the coil on a sort of wood-slatted helt.

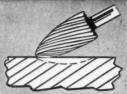
Imagine two shafts mounted in parallel, each of which carries four sprockets, so that four roller chains of equal length can travel side by side on these sprockets, in parallel. Further imagine these four roller chains connected by cross- slats at very frequent intervals, each slat being a piece of U-shaped steel in section, and holding a hard maple strip. Imagine enough slack being present in the slatted-chain-assembly top strand, to form a low place or pocket. In this pocket, the heavy coil of strip steel rests. A special drive-control and mercury switch are so ar-ranged to work in combination, that enough of the strip is unwound from the coil continually, to maintain a moderate amount of slack between the stock reel and the rollers on the press feed. The particular reel in mind will feed stock from coils having a maximum weight of 8,000 pounds. Coils may be as large as 28" in width, or 48" in diameter. The purpose of the wood slats is to protect finished surfaces of strip stock from being marred. This same type

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Shape "R"

TREE

for removing flaws and blending casting surfaces



Blending operation with the heavier section.

Shape "R" is available in base diameters of 4", 4", 4", 4", fine, medium or coarse cut.

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Pointed end removing a sand hole from a casting.



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Division NILES-BEMENT-POND COMPANY KELLERFLEX SALES DEPARTMENT

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of unit can be used for feeding wide strip stock to slitting machines or other equipment, if desired.

Roll feeds for punch presses really provide a simple method of feeding coiled stock, and are made in different types, to allow rapid, safe and accurate feeding under different conditions. A good indexing clutch is often a highly important part of a punch press roll feed. Some manufacturers of these indexing clutches have gone out of their way to make them highly accurate, so they will serve this purpose well. Where strip stock is being fed to a punch press, it is important to advance the material just enough, at each press stroke, that the next piece will be cut from the material very close to the opening where the preceding piece was cut out. Accurate indexing clutches incorporated mean more punchings, and less scrappage, from a given amount of strip stock.

For extremely high accuracy in automatic punch press feeding, the slide type of feed is probably the best to be obtained. Some of these slide feeds are sufficiently accurate that they can be used to feed stock to 8-position or 9-position progressive dies, without pilots. It is doubtful whether any other automatic feed can make this claim. As built by one manufacturer, the feed block of the slide feed reciprocates between definite stops. It is therefore impossible for any over-throw whatever to occur, through momentum. Such feeds for punch presses are available in a large range of sizes.

We have seen some punch presses which have been fitted with a conveyor, arranged to carry punched parts out of the press, and to deliver them through a gravity chute to a tote box. Standard silent chain make good conveyor belts for this purpose, for it is totally unaffected by oil, and but little affected by burrs on the parts handled. However, it should be noted that air blasts are more often used for unloading work pieces from the press automatically. One company makes a workejecting air compressor for the punch press, which forces the press itself to do its own unloading. This is, in effect,

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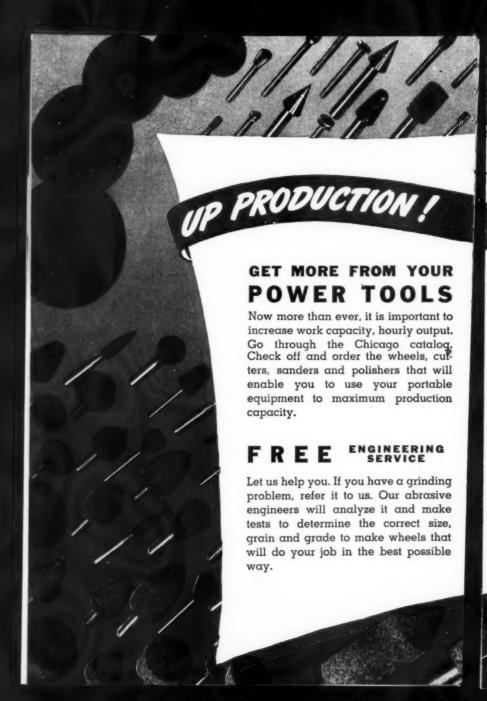






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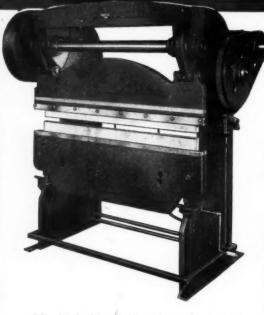
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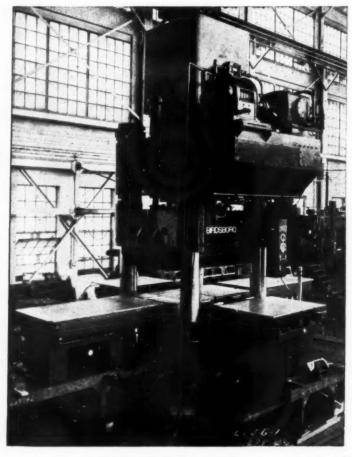
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a cylinder and piston, arranged in such a manner that the press ram compresses air in the cylinder, on its down stroke. This compressed air is released on the up stroke of the ram, as desired, blowing the work from the die into either chute or a work-receiving receptacle. The strength of the air blast on the work can be regulated by means of a petcock. If it is preferred to do

so, however, air blasts for this purpose may be taken from the shop air line. This involves the use of an air valve, which is operated to release a blast of air on the return stroke of the press ram, often through a trip dog provided for the purpose. There are a number of manufacturers of air blast unloading equipment for punch presses, and naturally there is some variation in design.



## NELCO Carboloy-Tipped 3 FLUTE END MILL

# did this job in 1/6th the 7ime

## New NELCO 3 FLUTE



 Plunges into solid metal and mills. Will bore hole and mill in one operation.





 Mills so smoothly that a finished cut is either not required at all. or to a much lesser degree.





 Provides Cooler and Freer Milling — More CHIP room decreases the chance of work overheating and twisting.

This tool is manufactured for use on all types of alloy steel, cast iron, brass and bronze. Sizes ranging from %" to 2" diameter.

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One of the objective tests used by Nelco Engineers was the cutting of a "keyway". (Results

illustrated below) End Mills compared were high-speed steel and Nelco's new Carboloy, tipped 3 FLUTE. Material was S.A.E. 1095 steel shatting. End Mills were ½" diameter: a 3 H.P. milling machine was used in both cases: 2400

R.P.M. and 14" per minute feed was used for the Carboloy; 609 R.P.M. and 3" per minute feed for the high-speed steel.

#### **OPERATIONAL RESULTS:**

To complete the job using high-speed steel end mill.



### NOW COMPARE NELCO RESULT!

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NOTE: ABOVE TEST PHOTOS UNRETOUCHES

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Remarkable methods of speeding the production of large presses, which cannot be fed with strip, have been observed in use, in getting out various shapes of metal parts for airplanes and similar work. One of these is a huge turret press of hydraulic type. This press has three columns. The arrangement is such that one of these serves as the turning column for the turret. As many as 10,000 or more miscellaneous aluminum alloy parts have been turned out by two men in an eight-hour shift, on such a press, it has been claimed. The revolving turret table can be indexed to either two or three stations, depending on the type of work being produced. There is an advantage in using the three-position setup as against the one with two positions, for it allows one station to be in process of unloading, while another is being freshly loaded, and the third station is being used for pressing. This press is one of the type carrying a rubber platen on its ram, by means of which sheet metal parts are formed in the dies on the press bed. The same trip switch which advances the platen to position in the press, also actuates the press ram, automatically.

Another huge rubber pad press which was much used during the war effort, and will find much use in the future, is equipped with four shuttle tables, to carry the work under the ram and out again. Because different operators are engaged in loading and unloading the respective shuttle tables, the press itself never needs to wait for loading. The loading and pressing operations are fully synchronized and automatically controlled. The pressing operation can

move in any desired sequence the operators select, by depressing respective start buttons in the particular order needed. Naturally, a press of this kind has very large volume.

#### NOTES AND COMMENTS

Hitch feeds for punch presses, of the two sizes mentioned, are available from the H. E. Dickerman Mfg. Co., Springfield, Mass.
 Reel stands used in conjunction with

A. Keel stands used in conjunction with automatic press feeds, for holding coiled strip properly centered for unwinding and feeding, are made by F. J. Littell Machine Company, Chicago, Illinois, by Wittek Mfg. Co., Chicago, Illinois, and by The Metzgar Company, Grand Rapids, Michigan.

3. The special strip stock reel which holds heavy coils in a packet of a wood-slotted

heavy coils in a pocket of a wood-slatted chain-belt, and hondles material as wide as

chain-belt, and hondles material as wide as 28", and coils as large as 48" diameter, is one made by Waterbury Farrell Foundry & Machine Company, Waterbury, Conn.

4. Roll feeds for punch presses are made by F. J. Littell Machine Company, Chicago, Illinand by Wittek Mfg. Co., Chicago, Illinois.

5. The company in mind that makes highly accurate indexing clutches applicable to punch press roll feeds is the Morse Chain Company, Detroit. Michiagn.

Detroit, Michigan.

6. Highly accurate slide feeds of the type described for punch presses may be obtained from the U. S. Tool Company, Ampere, N. J.

7. In at least one instance, a punch press. has been fitted with an unloading conveyor belt for punched parts, made of silent chain provided by Link-Belt Company, Chicago, Ill.

per to be particularly and the provided by Link-Belt Company, Chicago, Ill.

B. The firm in mind making a work-ejecting air compressor for the punch press, by means of which the punch press itself compresses the necessary air on each down stroke, is Logansport Machines, Inc., Logansport, Ind.

9. Included among those who make air blast unloading equipment for punch presses ore Briggs & Stratton Corporation, Milwaukee, Wisconsin, F. J. Littell Machine Company, Chicago, Illinois, Logansport Machines, Inc., Logansport, Ind., and A. Schraeder's Sons Division of Scoville Mfg. Co., Inc., Brooklyn, N. Y.

10. Both of the huge rubber-pad presses described, one of which is equipped with a large turret, and the other with four shuttle tables, are products of the Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa.

#### How to remove burrs - FASTER. new NOBUR tool you can burr holes faster-improve the finish of deburred parts and lower production costs by eliminating burring as a bench operation. The NOBUR tool works like a drill, making burring a fast, easy machine operation. The NOBUR tool is available in 1/16" progressive sizes from 3/16" to 1" in diameter. Write today for new complete burring folder. NOBUR MANUFACTURING COMPANY 910 North Orange Drive, Los Angeles 38, California



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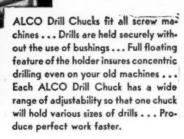
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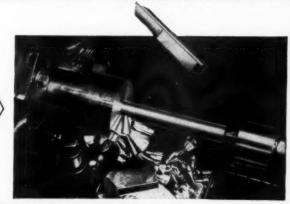
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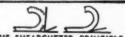


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## SPEEDING GRINDING SETUPS

By KARL F. KIRCHHOFER\*

AS tolerances have become closer and finish of work has assumed more importance, the grinding departments in metal working plants have risen steadily in importance. Plant executives are ever on the alert to take advantage of improvements and devices that will speed-up production, increase efficiency, simplify work set-ups and reduce the time involved in preparing work for

pieces. In these instances it is a simple matter to place the part, jig, fixture or work on the magnetic chuck, turn on the current and proceed with the grinding operations involved.

There are, however, many types of grinding jobs which, by reason of their form, size, shape and character cannobe readily held on the flat surface of the magnetic chuck itself. These include

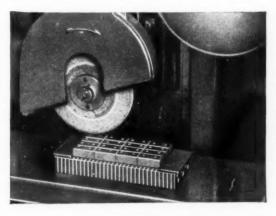


Fig. 1—In effect, these magnetic parallels are an actual extension of the chuck and thin pieces are adequately held in place due to the narrow laminations.

grinding operations. The latter factor is of particular importance and any accessory or improvement that will save time in setting up work is welcomed by production men.

We are concerned here particularly with holding work for surface grinding operations. Indispensable on every surface grinder and used by thousands all over the world are the magnetic chucks, in both electric and permanent-magnet types. These exert a powerful magnetic force and hold work that can be magnetized, for grinding. For many ordinary types of jobs, the plane surface of the magnetic chuck will readily hold work

angular, cylindrical, thin and special sizes and forms. In the past work of this type frequently required the use of vises, clamps and numerous complicated holding devices. Much time and effort was expended in preparing work of this nature before the grinding wheels even touched it. This has been particularly true of pieces with shanks, extensions, protruding parts and on work of this nature a great deal of setting up, inspection with Indicators, measuring, etc. were necessary.

Hundreds of grinding departments in

\*George Scherr Co., Inc., New York 12, N. Y.

plants thruout the world have solved the problem of holding work for grinding by means of laminated parallels, V-Blocks, Angle Irons and special shapes for unusual jobs. These magnetic chuck accessories are manufactured of alternate laminations of brass and a specially selected iron of high magnetic capacity. They are placed upon the plane surface of the magnetic chuck and obtain their holding power by conduction. These laminated pieces in effect become part of the magnetic chuck on a surface grinder and hold work with practically the same force as tho the pieces were on the chuck itself. The iron laminations measure 3/16" and the brass laminations 1/16". These diSmall, thin pieces often provide holding problems, particularly when the poles of the magnetic chuck are fairly wide apart. Here the machine operator may find that the thin work will not hold when the grinding wheel is brought into contact with it. By employing a magnetic parallel as shown in Fig. 1, as an actual extension of the chuck, the thin pieces are adequately held in place due to the narrow laminations.

It has been found too, that the use of magnetic parallels eliminates excessive wear of the chuck surface. It is well known that due to the fact the magnetic chuck surface is soft, frequent truing up of the plane surface is necessary. Experienced grinding men have found

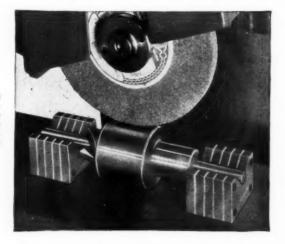


Fig. 2—Magnetic V-Blocks easily solve holding problems in connection with round work pieces. Here the piece is held securely while the flat surface is ground on top.

mensions were selected so that magnetic parallels and V-blocks may be universally used on all types of magnetic chucks.

The use of these accessories enables the grinding machine operator to place the work on the Parallels, V-blocks or Angle Irons, turn on the current and begin his grinding operation. In order to guarantee that the piece does not slip, shims or additional laminated parallels are placed in various positions to hold the work securely.

that instead of constantly grinding a few thousandths off the chuck surface itself in order to true it up, it is much easier and less expensive to regrind the laminated parallel true and square, place the work thereon and proceed with the grinding. This practice also saves considerable time since if the pieces to be ground are small, and thin, it is a much speedier process to true up the comparatively small surface of the parallel rather than to go over the entire surface of the chuck.

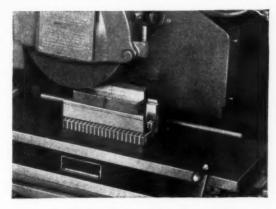


Fig. 3—Here a laminated angle iron is used in grinding a measuring table for a comparator.

Round pieces provide a holding problem which is easily and quickly solved by the use of laminated magnetic Vblocks, as shown in Fig. 2. Here the job calls for grinding the top flat. The V-Blocks hold the round shafts rigidly so that the grinding may be performed without fear of slipping. It is obvious that cylindrical work of this type could not be held safely on the plane surface of the magnetic chuck itself because of its shape.

Fig. 3 illustrates the procedure in



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TAYLOR & FENN Spring Presses are used for Riveting, Staking, Stamping and similar operations on small, light parts. They are constructed to compensate for variation in thickness of the work and to deliver repeatedly a UNIFORM BLOW.

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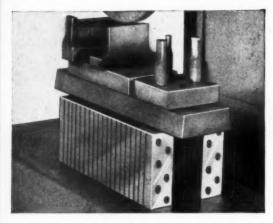
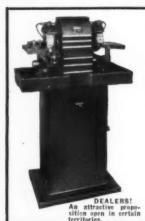


Fig. 4—Grinding job on a heavy, odd-shaped die, facilitated thru use of a set of laminated parallels.

grinding a measuring table for a comparator, square and flat, employing a laminated angle iron. The laminated magnetic angle iron is a most useful accessory for the magnetic chuck. It consists of a series of steps upon which may be placed all manner of special pieces for grinding without the use of complicated clamps and attachments, altho it is always sound grinding practice to block up the work with extra parallels, shims, etc.



# WILLEY'S NEW CARBIDE TOOL GRINDER

Willey's new 50-A Grinder is compact and designed for the rapid, economical grinding of carbide tipped tools as well as other types of tool bits that require keenest cutting edges and extreme accuracy. It handles rough, semi-finish and finish grinding of tool bits having up to  $2^{\prime\prime}$  square or equal cross section area. Bronze bearing trunnions support the tool rest table  $34^{\prime\prime}$  below work center, permitting grinding tools from  $3/16^{\prime\prime}$  to  $34^{\prime\prime}$  square without further horizontal movement — a Willey's feature that speeds production.

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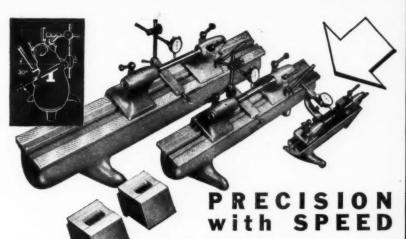
Complete specifications and illustrations of this new Willey's Grinder Model 50-A.

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Bench Centers in three sizes, each of modern streamlined design. Face of bed inclined 30° toward operator makes them easier to use and prevents their misuse as a "catch-all" for tools.

Sizes:  $8'' \times 36''$ ;  $6'' \times 24''$ ;  $4'' \times 10''$ . Riser blocks may be furnished for use under head and foot stocks to check larger diameters, if desired.

New Catalog 46 gives details. Copy on request.

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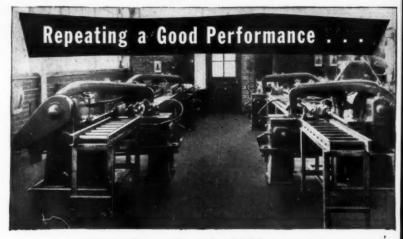
Fig. 6—These laminated were produced to hold parts that had to be ground to odd angles.

hold parts that had to be ground to odd angles.

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# THREAD CUTTING WITH SELF-OPENING DIE HEADS

By G. E. MAGER\*

THREAD cutting difficulties are caused by one or a number of different factors frequently resulting in much lost production time and scrap. This can be avoided by getting mechanical conditions set right first.

Only poor and usually tapered threads

perienced in this work. Major repairs or those requiring special instruments should only be done in the die head factory. When chaser slots or holder slots or bearings are badly worn the cutting edge of the chaser is not held in the proper relation to the work.

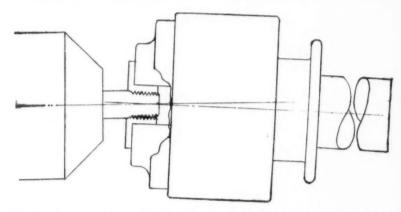


Fig. 1—The angle needed to start chamfer at root of thread.

can be expected from a die head with a bent or battered shank and worn or loose parts or from a machine with a badly worn bearing or misaligned spindle or turret hole.

Chasers must be uniformly and properly ground for the material they are to cut. The proper grinding of chasers is simple enough when the rules are followed. Instruction books on the care of die heads and how to grind chasers have been freely circulated by most die head manufacturing firms and can be had for the asking. The conditioning of die heads should be accurately and carefully done by mechanics ex-

Also chasers might become misaligned with one another. A feeler gauge might be used to determine the amount of play or wear in chaser or holder bearings. It is not possible to say exactly how much wear or play would cause trouble because much depends on the size and pitch of the thread and conditions under which a die head is run. It is known, however, a longitudinal or lengthwise play of .002" in one or more chasers is often sufficient to cause mistracking and tapered threads on average sized screws. On very small sizes even less than .002 will sometimes

<sup>\*</sup>Engineer, Eastern Machine Screw Corp., New Haven, Conn.

cause trouble. Chattered threads can sometimes be caused by too much lateral or crosswise play of the chasers.

It is an erroneous idea that because a die head has radial float it will compensate for all misalignment. Some benefit might be obtained when a sensitive radial float is provided in the die head or machine in which it is used so the die head can adjust itself to some minor imperfect condition and the chasers can cut their natural course without interference from such conditions. However, radial float is benefi-

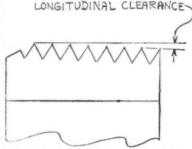


Fig. ?-Longitudinal clearance required.

cial only when the sensitivity is equal to the effort required to cut the thread. A stationary die head with radial float will hang down and when cutting soft materials or fine pitches the cut is often not heavy enough to lift the head as soon as the chasers contact the work. A tapered thread would result. A heavy die head in relation to the thread cannot be considered as sensitive. Much greater sensitivity is needed when cutting fine pitch thread or soft material than when cutting a coarse pitch or hard material. It is not satisfactory to test for sensitivity of radial float by merely lifting or wiggling the die head by hand because much of the sensitivity is lost due to torsional stress when cutting the thread. A torque of about two foot pounds is required to cut a 1/4 x 20 thread on soft steel with sharp chasers. A 1/2 x 13 thread requires 9 foot pounds and 3/4 x 10 requires 21 foot pounds torque. If a rod

is put through the chaser slots of a die head and a torsional stress is applied equal to the above (this can be done approximately by hand or a weight), some idea of the sensitivity of radial float can be ascertained. While the die head is under this stress note how much more effort is required to float or wiggle the head.

The sensitivity of pull-out float should be tested at the same time. Under torsional stress stationary die heads should pull forward easily and trip open. Automatic screw machines using revolving type die heads are designed so the threading spindle will move forward while cutting the thread. It is important to see that these spindles slide freely while under torsional stress. A worn key or other driving parts could cause considerable resistance. Pulling the spindle out by hand with torsional stress applied will give you some idea how great a load the chasers have to pull while cutting the thread.

Misalignment will also cause a drag against the threads when pulling the spindle out. Sketch No. 1 illustrates how chasers cut tapered threads due to misalignment. This is often the cause of chaser breakage. If a bar of stock slips in the collet or chuck while the thread is being cut it usually becomes misaligned and often results in chaser breakage.

The conditions which cause the need for radial float should be avoided as much as possible. The policy in some factories is to keep all machines on which die heads are used, well aligned. This greatly helps to reduce threading problems. A thousandth or two misalignment should not matter but several thousandths would likely be troublesome. Fine pitches and close thread tolerances require greater accuracy in machine and die head conditions. Perhaps the most excusable need for a die head to have radial float is when it is necessary to cut threads on out of round stock or when work is chucked without turning the thread diameter. However, the float will not always insure straight threads or lead accuracy if the run-out is considerable. Some models of H&G threading ma-

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GRAHAM MFG. CO. 58 Bridge St., East Greenwich, R. I. chines are equipped with a removable bushing in the work slide to provide for radial float in the collet spindle. I do not find this float is often used. It is preferred that the machines are kept in line and without float. The requirements to produce good threads seems to be too lightly regarded in some shops. When there is good alignment and a true running condition no radial float is needed. Then with proper start and pushing pressure straight concentric threads are assured. This is an ideal condition under which to cut threads.



Fig. 3—The use of H-C die-head with front end trip on Brown & Sharpe automatic.

There is a slight longitudinal or back clearance (see Fig. 2) provided in the chasers which is sufficient to allow for a slight misalignment or untrue running condition. If the radial float in a die head is not sensitive enough to allow proper alignment at the start the tendency will be for the die head to gradually start to align itself while the thread is being cut. This usually tapers the first few threads before the alignment is completed if at all. Under such conditions sharp chasers will usually cut more taper than those not so sharp. It is known that chasers with a circumferential land and chamfer and which are commonly called hobbed or tapped chasers, will with their wider bearing on the work align the spindle or die

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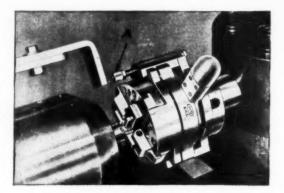
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Fig. 4—Die Head with front end trip, shown in operating position, mounted on the turret of a lathe.



head under worse conditions than the milled or other types with only a line contact on the work However, conditions should not exist so that only tapped chasers will cut straight or parallel threads. Even tapped chasers will fail or have shorter life if the misalignment or other conditions are bad enough.

Imperfect threads are sometimes caused by a very critical condition. Cutting tapered threads has been corrected by a mere change of oil. Also one bar of stock will sometimes cut tapered threads where another bar of the same lot will cut straight. Even a change of cutting speed will sometimes correct or pro-

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duce taper. However, these conditions are very infrequent and usually caused by freak conditions.

Chasers should not have to do any other work than cut the thread. They should not have to pull the die head forward to trip open. To expedite this

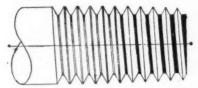


Fig. 5-Screw thread with considerable taper.

feature a front end trip is showing at (a) Fig. 3 on H&G Style DM Die Head which is designed for Brown & Sharpe Automatics. The threading cam lobe on the machine should push the head forward until the front end trip contacts the stud on the machine and trips the head. If the job of pulling the die head

on the work is left to the chasers the sharp back edges of the teeth will sometimes shave the flanks of the threads and cause taper. Fig. 4 shows H&G stationary die head used on turret lathe. Front end trip is shown at (a). It is recommended that the threading cam lobe on Brown & Sharpe Machines move the turret forward approximately 5% faster, or less for long threads, than the natural forward travel of the die head. This will build up a pressure in the bunting spring in H&G die heads and will counteract the forward resistance of the cut. The pressure should be maintained throughout the entire cut and the front end trip should be used to open the head. The front trip is also a decided advantage on short threads and close to shoulder

Screw machines using revolving type die heads usually have a spring pressure which pushes the threading spindle forward to start the die head on the work. The pressure should be maintained and push the die head during



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the entire cut. Sharp or dull chasers and variations in chamfer relief cause wide fluctuations in starting pressures. Some idea of the effort required to start chasers cutting can be gained from the following table. Best results are usually obtained with chasers requiring the least starting pressure of that size. Approximate starting pressure using properly ground sharp chasers with a standard chamfer of 20° on SAE 1112 Steel are shown in Table A.

ror to use too little pressure on automatic machines which often causes tapered threads as shown in Fig. 5. The first few threads are thin.

Suggestions for grinding chasers for close to shoulder threading have been published and freely circulated. Yet operators often grind away the chasers to shorten the chamfer as shown in Fig. 6. How can chasers start on the work or cut properly when the chamfer starts above the root of the chaser?

|                     | 1/4×20 | ₁⁵∉ <b>x18</b> | 3 <sub>8</sub> ×16 | ½x20 | 5%x18 | 3/4×20 | 3/4×16 | 3/4×10 |
|---------------------|--------|----------------|--------------------|------|-------|--------|--------|--------|
| Approx.<br>to Start | 1.DS.  | 10             | 20                 | 5    | 5     | 5      | 8      | 15     |

It was found that threads with less helical angle required less starting pressure. When threading brass only about one-half the table pressures were required. About twice the table pressures were required for threading heat treated steels of about 30 Rockwell. Too much pressure can also cause tapered threads but it is a common er-

If the chamfer must be short the chamfer angle should be increased. It is also well to grind an undercut as shown to allow for a chip clearance. Use a magnifying glass to see that the chamfer does not start above the root of the chaser thread.

It is suggested a magnifying glass of about 5 power be used to inspect chas-



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CITY MACHINE COMPANY Piqua, Ohio ers before installing them in the die head. Sometimes a slightly chipped or crumbled corner on the chamfer teeth is disclosed. Such chasers will usually cut a rough or tapered thread. The use of a magnifying glass is essential before and after grinding. Not enough im-

GROUND AWAY.

GREATERANGLE
NEEDED TO START
CHAMPER AT ROOT
OF THREAD

UNDERCUT
NAGLE

Fig. 6—Misalignment is exaggerated to show how chasers cut tapered threads.

portance is attached to this inspection and much time is lost trying to cut good threads with unfit chasers. Face grinding of chasers should be eliminated as much as possible, since this reduces the amount of bearing on the work. If face grinding should be neces-

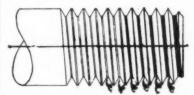


Fig. 7— How chips adhere to thread when one chaser does not track properly.

sary then only the least amount should be removed. Wire brushing or scraping the profile edges of the teeth after grinding will help prevent shaving flanks of the threads on the work.

A question frequently asked is why do chasers cut tapered threads when in one slot position of the die head but



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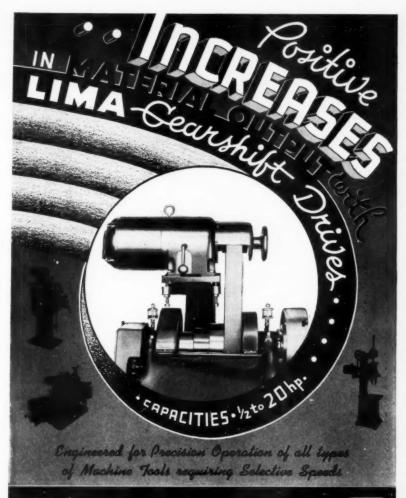


when changed to another position they cut straight? In the manufacture of chasers it is necessary to have manufacturing limits. No trouble should be encountered even if all the high or low manufacturing limits are accumulated in one direction. However, when such an accumulation is added to unfavorable machines or die head conditions then trouble can exist. By changing chasers to another slot position in the die head the combination can sometimes be broken up.

A test for accurate chaser cutting can be made by allowing the die head to cut a thread the full width of the chasers and then stop the machine before the head opens. The spindle should be reversed very slightly so the chasers will not break off the chips when the die head is opened. Next trip the die head open. If it is found that one chaser is causing a row of chips to adhere to the work, then that chaser does not track properly with the others. This results in imperfect threads. Figure 7 illustrates the appearance of a row of chips on the work. This will seldom happen if chaser slots are not too worn and if holders are clean and no foreign particles are causing misalignment.

"Not Go" thread ring gauges which have been in use for some time are usually worn and permit straight threads to enter sometimes three and four turns. Some good work has been rejected by worn gauges. Use thread micrometers as a check against inspection gauges. A lead indicator is essential to determine accuracy or amount of error in the pitch.







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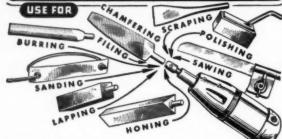
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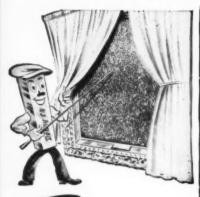
### EXPANSION AND MODERNIZATION By Arthur Roberts

The postwar period of expansion, modernization and business promotion is at hand. Strikes and other difficulties have delayed the day when the material requirements for postwar betterment will be available, but before long, the user of machine tools should be in a position to give his business a face-lifting if he desires. However, inasmuch as many users of machine tools do not have ample cash to under-write this work themselves, they must borrow funds, and the majority do not have a comprehensive idea of the various sources of credit. There has been much expansion in this field during the past 15 years and inasmuch as credit is an essential to successful business management and a knowledge of available credit sources as important as knowing the suppliers of equipment and materials in your industry, we offer this information for your guidance.

The private commercial bank is the small and moderately sized businessman's main source of business credit. Moreover, these banks are beginning to rely more and more on the small businessman's patronage because big business is depending more and more on internal credit or the issuance of securities to meet capital and credit requirements.

Most communities have more than one bank and there is sometimes a big difference in the character of service given. Some bankers are more progressive than others, show more leadership. Choose a banker who is willing to assume a risk for a reasonable chance of repayment. Some bankers are too conservative for these times, others do not know a good thing when they see it. A banker should be a good businessman and some are not. It doesn't pay, how-





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Industrial banks, organized originally to specialize in consumer installment loans, have been making increasing business loans in recent years. Loans usually run a year or two, payment in installments, rates often high. Some states limit the size of these loans. Some industrial banks operate like commercial banks under regular bank charters, hence, offer the same ratios and service as state banks. This credit source is not recommended for business credit unless competition has brought the rates down to reason. Remember that there is competition between the various credit sources which the user of machine tools can utilize to his advantage if he shops around. The multiplicity of credit sources over the old days when the local bank had the field to itself, especially in the smaller communities, is beneficial to the seeker of credit if he plays his cards right and knows the various points of contact, which is the purpose of this article. There are about 700 industrial banks in this country. Only North Dakota, South Dakota and Vermont are without them. Morris Plan banks are typical of industrial banks.

Factoring companies, or factors, buy accounts receivable outright and have many small businessmen as clients. Their names may be found in telephone directories, mostly in big cities. They also provide credit counsel and fees may run 16 per cent of purchased receivables. Remember that there is a difference between buying accounts receivable and lending money on them. If you sell your accounts without recourse, the purchaser has no comeback, no matter how many debtors fail to pay, but if you borrow on your accounts, the lender may be able to levy against your whole business if he cannot collect from you the entire amount borrowed. Scan carefully any papers you sign in this regard so that you know what you are doing.

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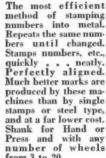
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> > Bulletin BB-1H.

NUMBERALL STAMP & TOOL CO. HUGUENOT PARK STATEN ISLAND 12, N. Y. more than 1,000 in the country today. They buy paper with recourse or without recourse to you if your customers do not pay. The latter carries higher rates. Sometimes you dun for payment, sometimes the sales finance company contacts debtors direct. Telephone directories list a miscellany of finance companies but some are in the category of "loan sharks." Check them through the local Chamber of Commerce before doing business.

Manufacturers and distributors of fixtures, trucks, machinery, office appliances, etc., offer credit via installment terms on purchases. Costs vary widely. Financing the purchase of new or used equipment by a bank loan secured by a lien on the equipment is different and sometimes the cost is lower. Compare before you act. Chattel mortgages are like equipment loans, except in the transfer of title, and are on property already bought and paid for. Moreover, the money borrowed may be used for a different purpose entirely. The property under chattel must be movable so that it can be attached if the loan is defaulted.

National banks make first mortgage loans on improved business property. state banks under state statutes, also savings banks, trust companies and insurance companies. If you are thinking of buying additional property for expansion, they may be a credit source. Banks also lend money on life insurance policies at as low as 3 per cent interest but you may be asked to get a co-signer and you must have a cash equity in the policy to cover. If you have borrowed on a policy from the insurance company at a higher rate, a bank may take over the loan at a saving. Do not confuse a lean on a life insurance policy with a mortgage loan given by an insurance company.

Small loan companies charging 21/2 to 3½ per cent a month or from 30 to 42 per cent a year make as high as 10 per cent of their loans to business people. Obviously, such charges are far out of line with what any businessman

Model 1H

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WHAT A SAVING OF TIME as well as a greater degree of accuracy and alignment of the finished hole.

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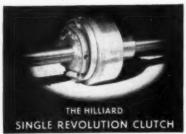
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Community industrial development groups and cooperative groups of small businessmen in different localities are being formed to procure credit for new and old enterprises. If interested in organizing such a group, ask the local Chamber of Commerce, the local Committee for Economic Development or one of the field offices of the U. S. Department of Commerce, for information.

Every user of machine tools is familiar with the credit extended by suppliers but too few know how much it costs them. Sometimes high-priced suppliers extend credit that lower-priced suppliers cannot give, the purchaser paying a substantial invisible fee for the credit. Of course, in this day of shortages, price is often a secondary factor, but the time will come when materials are plentiful again and price versus value will come back to market. Before the war, careful attention to buying saved considerable money for businessmen who maintained an adequate system of stock control, analyzed it periodically for data on prices, quality and relative value from the standpoint of production efficiency and "buy appeal." This routine is still part of good business management and will become increasingly so as materials become more plentiful again. Wise businessmen compare the offerings of suppliers from all angles to get an idea of what the credit given them is costing them. Missing cash discounts is also a costly form of credit. Some businessmen pay their rents with cash discounts. It may pay to borrow the money to take these discounts. Check this angle.

Aside from these private lending agencies, a businessman can turn to the government for funds.

The Reconstruction Finance Corporation, created in 1932, has been expanded considerably to date. It is generally thought that this agency is a big business institution but figures through 1944 show that 47 per cent of loans were \$10,000 or under. The Federal Reserve banks were authorized in 1934 to make industrial and commercial loans, but at no time, has there been more than 32

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Cutting flat material to size and shape for part to be duplicated. The D1-ACRO Shear rapidly resizes and squares material, also makes slits, strips, notches, angle cuts, etc. 3 sizes,—shearing widths 6", 9", 12".



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millions in credit outstanding, hence, this program has done little to alleviate credit headaches. It is the consensus of expert opinion that the roles played by both organizations in solving the financial problems of small businessmen has been slight. A businessman can get loans from these sources if otherwise unavailable. If he cannot get funds from his own bank, he is hardly likely to procure them from the RFC or Federal Reserve system.

The Small War Plants Corporation, still in operation, was created for small manufacturing plants, to finance war work, and make termination and surplus property loans. The user of machine tools is out of this picture unless his output was in some way connected with war work.

A veteran is eligible for business loans under the Serviceman's Readjustment Act for an existing business or new venture. Because this Act may be amended from time to time, it is best to consult a veteran counseling or-

ganization before proceeding. The National Association of Creditmen, with offices over the country, has organized a special program to help veterans who have small business problems.

Under FHA, the small businessman can get loans for the construction of new small commercial buildings or their modernization and the repair of old buildings. Loans cannot be used for machinery or equipment. Maximum size, \$3,000, maximum term, 3 years, the per annum interest rate is about 9.7 per cent.

If you contemplate expanding or modernizing, first set up a budget covering this work so that you will know how much money you will need, then contact the likely sources given in this article, get their terms and compare the cost, and before signing, read the contract. If in doubt, consult a lawyer. Fore-warned is fore-armed.

The American Bankers Association and the government have been working on programs to aid small businessmen in their need for credit, so the outlook

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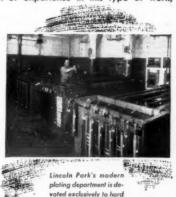
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John Humm Safety Equipment Co. 253 SHEFFIELD AVENUE BROOKLYN 7, N. Y. in this field is more promising than it has been for some years. The reason why the credit problems of small and moderately - sized businessmen are under scrutiny is not altogether altruistic. Big business can borrow at very low rates if it borrows at all. Small businessmen who obtain commercial bank credit pay interest that averages up to three times or more the rates paid by large borrowers. The smaller businessman pays more for his credit, and if a way is found to service sound accounts at reasonable cost, he offers much greater profit possibilities because there are so many more of him.

When considering expansion problems and the credit needed to finance them, also include the tax on the increased business expected. The progressive tax increases as profitable volume touches higher brackets. This tax is a fixed charge that cannot be cut so interest payments on postwar loans and installment payments on the principal must be considered in advance so that these three outlays do not cripple

working capital.



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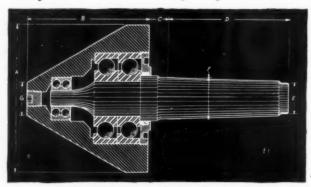
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Dahlstrom TAP GUIDE

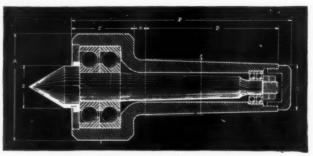
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# Practical Applications of Adjustable Speed Drives

By B. T. ANDERSON\*



PRODUCTION increases as high as 48 per cent are possible when electronically controlled, adjustable speed motor drives are applied to lathes and milling machines. Four typical machining operations wherein this drive is used are discussed in this article.

The first of the electronically controlled, adjustable speed motor applications to be discussed is the grooving of an end plate for a cartridge reel. The problem was to provide a high production, automatic cycling machine for cutting the spiral groove. This groove is .065" wide and .070" deep. This job was first tried in a typical tool room set-up using a vertical milling machine and a dividing head. The diameter end mill required wouldn't stand up so it was finally necessary to substitute a stationary tool. However, this set-up was costly as it required the services of a highly skilled tool maker, tied up a tool room machine, and only produced 1.5 pieces per hour. This was far below production requirement so recommendations for improved methods were requested. After studying the job and considering the urgent need for the equipment, our engineers decided to adapt Sundstrand Automatic Lathes to the operation.

The completed machine with a finished part in place is held on a centralizing plug and manually clamped against a face plate mounted to the machine spindle. On the back side of the face plate, is a master cam which has a spiral track similar to the groove to be cut. On the special tool slide is mounted a cam follower which rides in the cam

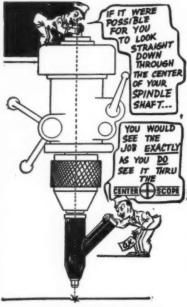
track. Thus simultaneous revolution of the machine spindle and master cam controls the forward feed of the tool slide.

Because of the frailness of the part, the groove could not be cut full depth in one pass of the tool. Furthermore, the curvature of the spiral and the width of the groove limited the size and shape of the tool that could be used, making it necessary to take a number of shallow cuts until the desired depth of 0.070" was reached. In order to make the cycle completely automatic, it was necessary to provide a ratchet type "in feed" device which would advance the tool some predetermined depth during the return stroke. The amount of the "in feed" is adjustable from 1 to 7 thousandths of an inch. Attached to the ratchet mechanism is an adjustable dog which can be set to trip a limit switch when the desired depth of cut is reach-

In order to maintain maximum accuracy and tool life, it was necessary to withdraw the tool from the cut for the return stroke. This was done by applying a simple tool relief mechanism.

<sup>\*</sup>From a paper presented at the Westinghouse Machine Tool Forum by B. T. Anderson, Electrical Engineer Sundstrand Machine Tool Company, Rockford, Illinois.

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engages a roller which retracts the tool approximately 1/8". Then during the return stroke of the slide, the tool is advanced by the ratchet mechanism and reset to cutting depth by roller engaging the cam.

It is evident that, for this operation, the cycle should be automatic so that by pushing a button the machine would start and go through as many cycles as would be required to obtain the necessary depth of the groove, and then automatically stop. The circuit designed to do this is a simple planer type circuit in which two limit switches controlled the direction of travel, and a third limit switch stops the machine when the cut is completed. The direction control limit switches are operated by the tool relief mechanism. At the end of the forward or cutting stroke, the first switch is released and the second is tripped as the tool relief mechanism retracts the tool from the work. This reverses the spindle drive motor which in turn reverses the spindle and returns tool slide to its starting position. At the end of the return stroke the tool relief mechanism returns the tool to the cutting position, thereby releasing the second switch and tripping the third switch. This reverses the spindle motor and spindle rotation, and starts the tool slide forward for the next cut. When the required number of cuts have been made. the dog on the ratchet "in feed" mech-anism trips the limit switch which stops machine at the end of the last return stroke. Referring to the cutting tool, it is evident that as near an ideal cutting speed as possible must be maintained throughout the cut in order to secure maximum tool life. Too high a speed would burn up the tool-too low a speed would sacrifice production.

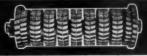
It is obvious then that for maximum production the spindle speed in the forward direction should be automatically varied so that a constant surface speed is maintained. Also, the speed in the return direction should be as high as possible to reduce nonproductive time. Other requirements for the drive are

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smooth reversal, straight line response on speed adjustment and fast acceleration. These are all inherent characteristics of the electronically controlled, adjustable speed motor, and this type of drive was selected.

Since the cut is very light, the total load on the drive is practically constant torque because it is mostly due to machine friction. For this reason, armature control which is constant torque and has straight line speed response was ideally suited for the forward speed of the machine. The forward speed is controlled by a potentiometer rotated by a gear. This gear is driven by a rack which is fastened to the tool slide. The gear and rack are so designed that the total cutting stroke rotates the potentiometer through 300° which automatically increases the speed of the drive motor from 575 rpm to 1150 rpm as the diameter of the cut decreases.

In the reverse direction the speed is controlled by a separate potention-

eter which is manually adjustable from 1150 to 2300 rpm. The reverse speed is then set at a value which will give the best results. In this case, the reverse speed found to be most satisfactory was 1750 rpm.

Tests made after the machines were placed in operation proved that best results were obtained with the tool taking a 0.002" cut. Therefore, the machine made 35 cycles of cut and return to complete 0.070" deep groove.

The production for the two machines is 10 pieces per hour, and both could easily be run by one unskilled operator. This production was 567 per cent above that obtained in the original toolroom setup.

When the machines were designed the first drive considered was a two speed motor with 1800 rpm for the return speed and 600 rpm for the cut speed. However, with the two speed setup the production would have been

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6.7 pieces per hour per two machines as compared to 10 pieces with the electronic drives.

The machines complete with variable speed drives cost 10 per cent more than if they had been equipped with 3 to 1 ratio two-speed drives. However, the 10 per cent additional first cost is more than justified when one considers the fact that the production increased 48 per cent. In other words, two machines with variable speed drives produced as much as three machines with 3 to 1 ratio two-speed drives. The second application is of equipment for machining an internal clearance radius in a propeller barrel. This formerly was a milling operation, but, due to the difficulty of maintaining expensive form cutters, another method of machining was requested. The machine furnished is basically a Sundstrand Model 12 Automatic Lathe, equipped with a special front carriage and radius turning attachment.

The cycle of this machine is a standard Sundstrand Automatic Lathe cycle of rapid approach, feed and rapid return. The spindle runs during the rapid approach and feed stroke and is stopped during the return stroke.

At the end of the approach stroke the carriage feeds momentarily until it reaches positive stop. At this point the radius turning attachment starts operaing and feeds the tool for the remainder of the feed stroke.

It can readily be seen how the diameter of the turned surface decreases as the cut progresses towards the center of the part. This difference in diameters at start and finish of the cut is in a ratio of 2 to 1. Previous experience had shown that the highest production and best tool life would be obtained by cutting at a constant surface speed. Hence, the drive selected for the spindle was an adjustable speed motor.

The cut is quite heavy and the load on the spindle motor in this case is principally due to the cut. The torque required for the cut is a function of tool

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pressure and the distance between the center of the spindle and the point at which the metal is being removed. With the material and depth of cut being uniform the tool pressure is constant. However, the distance between the center of the spindle and the tip of the tool varies in the ratio of 2 to 1 from the start to the end of the cut. Therefore, the torque decreases, and the speed required increases in the same ratio which makes this a constant horsepower application.

To drive this machine at 5 hp, 690/2070 rpm constant horsepower motor with speed variation by field control was selected. The controlling medium again is a potentiometer with 300° of rotation to obtain speed change from 690 to 2070 rpm. The motor in this setup is required to start at low speed, then gradually accelerate to the high speed at the end of the cut, at which time the motor is dynamically braked to stop the spindle.

The potentiometer is mounted on and moves with the front carriage. A cam

having a track is fastened to the carriage drive rack which moves only with respect to the carriage when the carrige is in feed against positive stop. Hence, when radius turning attachment is feeding, the cam is moving with respect to the carriage. Track in the cam moves the roller which is fastened to the rack. This rack, in turn, rotates the shaft of the potentiometer by means of a pinion.

Since the required speed change is approximately through a 2 to 1 range, and, since the potentiometer provides a 3 to 1 range in 300° of rotation, it is only necessary to use 207° of the potentiometer travel. To obtain the desired surface speed the potentiometer arm was set so that the motor speed varied from 1025 rpm at the start of the cut to 1975 rpm at the finish of the cut. With this setting of arm, it was possible to secure surface speeds for this operation within a range of 40 to 420 sfpm by varying the combinations of the standard spindle speed, pick-off gears.

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With this arrangement, the customer was able to use a standard straight shank, T. C. tipped, lathe tool costing approximately 3 per cent as much as the form milling cutter. Actual maintenance of the tool was much easier and production was approximately the same. Compared to a similar lathe setup using a constant speed motor, the tool life was increased 300 per cent and the production approximately 30 per cent. The third application is of special machines for milling the "faying" surface on a steel propeller barrel and a mating surface on an aluminum part. The difficult part of this job is to maintain the accuracy and uniformity of finish necessary at all points on the irregular surface to be machined. Note that the machine must have four "rise and fall" movements of the cutter as the part is rotated through a full 360°. The machine furnished for this operation consists of a cross feeding head carrier with vertical ways, a swivel type power fed head mounted on the head carrier ways, and a rotary table driven by an adjustable speed motor. The cross feed

of the head carrier is by means of one hydraulic cylinder and the vertical feed of the head by a second hydraulic cylinder. One hydraulic pump supplies both cylinders and the sequence of operations is controlled by cycle valves. The hydraulic system is controlled by electrically operated solenoid valves and is interlocked with the table drive unit to provide a complete automatic machine cycle after the part is loaded in the fixture.

The cycle of the machine is as follows: First the table is positioned by a limit switch so that the cycle cannot be started unless a table dog engages the limit switch. With the table in position and the part loaded the operator pushes the "cycle start" button. The column then rapidly approaches and finally feeds just before positive stop. At positive stop the head feeds down until the roller engages the cam. Just as the roller touches the cam a limit switch on the head starts the rotary table in the cut direction. The rotary table then feeds 360° at which point a table limit

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switch reverses the head hydraulics. The head then rapids up to positive stop, and then the column rapid returns to its starting point. When the column is all the way back, the table reverses and feeds back to reposition itself for the start of another cycle.

The table is driven by an electronically controlled adjustable speed motor with a speed range of 50 to 1150 rpm by armature control in the forward or cutting direction. In the reverse direction the speed of the motor is adjustable from 50 to 1150 rpm by armature control and 1150 to 2300 rpm by field control. The motor is rated 2 hp at 1150 rpm and is forced air ventilated by a blower which supplies air at the rate of 50 cu. ft. per minute.

The speed range in the cutting direction provides table feed rates from 0.43" to 10" per minute at the work diameter which is 13½". The forward feed rate can be adjusted manually, and it is adjusted automatically during the cut. In the reverse direction the max-

imum rate theoretically is 20" per minute, but due to decreased torque by field control, the speed of the motor is limited to 1900 rpm which is equivalent to 16.4" per minute at the work diameter. The reverse speed is manually controlled by a separate potentiometer.

A machine with a high speed head was used in milling the aluminum part. The spindle operates at 3400 rpm and it is directly belted to its drive motor. The machines for milling the steel part are similar except that the head is of the geared type with spindle speeds from 50 to 2900 rpm by pick-off gears. Both of these heads can be pivoted so that the spindles will be 15° from the horizontal either up or down.

As mentioned, the tolerances for machining this contour were very close. As the size of the cutter was limited to one with a ¾" diameter shank it was feared that any unevenness in the feed rate would show up in the finished cut. Therefore, an electronically controlled adjustable speed motor was applied to

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The formula is:

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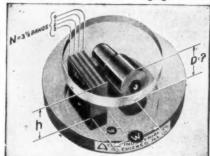
Substitute the actual values

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drive the rotary table so that the feed rate with respect to the cutter would be constant.

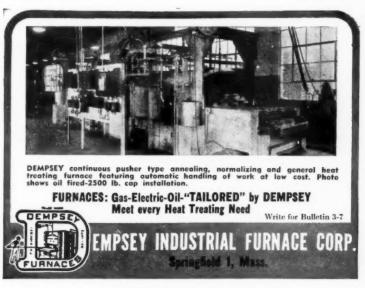
The head has four rise and fall cycles while the table makes one complete revolution. The diameter of the work at the cut is 13½" which corresponds to a circumference of 42". However, the actual cut is approximately 52" long. Therefore, if the table feed rate were constant, the average feed rate at the cutter would be about 25 per cent higher than the table feed. Since the steepest angle the cutter climbs is 48° with the horizontal, the actual instantaneous feed rate may be 50 per cent above table feed rate.

To compensate for the action of the vertical feed our engineers designed a unit which maintains constant feed at the cutter and also provides the feed rate adjustment. Since the four rise and fall cycles of the head are identical, the shaft which rotates the cam makes four revolutions as the table makes one. The cam moves the cam follower bar vertically. Fastened to the cam follower

bar is the feed rate adjustment plate which by means of a roller fastened to the rack moves the potentiometer to adjust the speed of the table drive motor.

The gear ratio between the rack and the potentiometer is such that 1.60" of movement by the rack rotates potentiometer arm through 300°. This varies motor speed from 50 to 1150 rpm. The design of the speed adjustment plate is such that regardless of its setting the vertical stroke of cam follower bar changes the table feed in the ratio of 1.5 to 1. When the adjustment is such that slot, which actuates roller on the rack, is at 35° with the vertical the motor speed ranges between 776 and 1150 rpm, and the setting produces maximum feed rate. The minimum feed setting is such that the motor speed varies between 50 and 74 rpm.

Therefore, by adjusting from maximum to minimum the angle between the slot and cam follower bar, the



actual feed rate at the cutter can be varied in a ratio of 15.5 to 1. Also, at any setting of plate, the table feed rate is varied automatically through a range of 1.5 to 1 to maintain a constant feed rate at the cutter. This compensates for the vertical feed caused by the rise and fall action of the head while following the master cam.

The fourth application involves a special machine designed to mill the circular, partial and dome fins on the forged aluminum cylinder heads for airplane engines. This machine is designed to mill all fins in two operations as against four operations in customer's old set up. In the first operation all the body fins, both circular and partial, are milled. In the second operation all the dome fins are milled.

In order to describe the machine functions, it is best to discuss each of the various drives separately and then to describe the sequence of operations.

The machine operates on the "Copy

Mill" principle in that the depth of each cut is controlled by the roller in the spindle member, engaging a master cam which is mounted on the work rotation drive. The spindle and the cam roller are mounted on the rocker arm. This rocker arm is pivoted on widely spaced bearings. A hydraulic cylinder provides rapid approach, slow feed, fast feed and rapid return to cutter and roller by rocking the arm about its pivot point.

The spindle is driven by a 7½ hp, 3450 rpm squirrel cage motor. The drive is by V-belt to a jack shaft through the center of the rocker arm pivot. The jack shaft is in turn connected by V-belt to the spindle.

The work and the master cams are rotated by means of a two motor, mechanical feed box. The rapid traverse movement is driven by a special high torque, squirrel cage motor. The feed is driven by an electronically controlled adjustable speed motor. This motor operates from 1750 rpm down to 175 rpm by armature control which is constant torque. With the feed motor operating at 1750 rpm the output of the feed box can be varied by "pick-off" gears so that the work rotation from one-half to four rpm can be obtained. This is on a 10" diameter corresponds to feeds from 15.7 to 125 inches per minute. It is obvious that any feed rate as set by the "pick-off" gears can be reduced in a 10 to 1 range by adjusting the speed of the feed motor. The output of the feed box is transmitted by a worm wheel to splined shaft. This splined shaft rotates the cams and the work holding fixture simultaneously.

After each cut, the work slide and the cam carrier slide are indexed laterally to position for the next cut. The indexing mechanism consists essentially of an electrically operated rotary index base which has been converted to linear indexing by gearing to it a suitable lead screw. The lead screw has a single thread on the balance. The triple thread section moves the cam carrier slide and the single thread section moves the work slide. Hence, for each index, the cam carrier slide moves three times as far



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as the work slide. This allows the cams and cam roller to withstand the force required to hold cam roller against the cam during the cut. The dog plate at the top is rotated by the splined shaft that rotates the cams and the work. The dogs on this plate control the rotary motion of the work.

The notched plate is the index plate and has one notch for each fin to be milled. The mechanism on the upper right of the plate is the locating plunger. The control of the index movement is by four limit switches operated by the plunger. The switch in the lower right hand corner operates to shift the work rotation control from the 360° plus cycle for complete fins to the partial cycle. This switch is not used on the second operation because the dome fins are all partials and the machine is converted to cutting partial fins at all times by setting a selector switch in the push button panel.

Under normal operation, the operator loads the work and then pushes the "Cycle Start" button. This starts rocker arm in rapid towards the work and also starts the spindle motor. Just before cutter reaches the work a limit switch is tripped by the rocker arm which puts the arm in slow feed and starts work to rotate at 1/10 of its maximum feed. Just as the cutter reaches its depth, a limit switch is closed by cam roller mechanism which puts both the rocker arm and the work rotation in fast feed. At the completion of the cut, the rocker arm rapid returns to its starting position. When this position is reached, the work rotation rapid returns to its starting position and the work and cam carrier slides are indexed to positions for the next cut. With the work returned to its starting position and the indexing completed, the rocker arm automatically starts in towards the work and the above cycle is repeated until all fins are cut. With the cuts completed, the index mechanism returns the cam carrier and the work slides to the position for the first cut. The operator now unloads, loads and presses the "Cycle Start" button for another cycle as described above.





The depth of cut, in the first operation, varies from zero to the maximum possible with the cutter. Also, it is obvious that no two cuts are alike. The conventional approach on this job would be to set the feed rate to suit the deepest cut. If this were done, the production would be low. The next consideration would be to use more than one feed rate, but this is not practical because each cut is different which, for a maximum production, requires a special feed control setup for each cut. The ideal solution from the production angle would be to vary the feed rate automatically so that the cutter would always be loaded to its full capacity and to limit the maximum feed so that the chip per tooth would be within good milling practice.

This solution, with the equipment available a few years back, would have been considered impractical but the advent of the electronically controlled, adjustable speed motor provides a tool which can be used to solve many of the drive problems, which would have been

considered impractical in the past.

In order to get the variable feed rate, a  $1\frac{1}{2}$  hp. 1750/175 rpm, electronically controlled, adjustable speed motor was used on the feed drive in place of the conventional constant speed motor. In the previous drives described, the speed changing has been accomplished by means of a potentiometer. This method is not suitable for this application because the load on the cutter must control the speed of the feed motor.

As the drive to the spindle is by means of a squirrel cage, induction motor the power required by this motor must furnish the control medium. The power of a squirrel cage, induction motor operating between 75 and 125 per cent of its rating is for practical purposes a direct function of the line current drawn by the motor. This permits the use of a current transformer in one of the lines to act as the control medium. The output of the current transformer is rectified and amplified and then fed into the control circuit of the





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standard electronic control panel.

The controls are so designed that the feed motor runs at maximum speed as long as the load on the spindle motor does not exceed its rated hp. This limits the maximum cnip per tooth to a desirable value. Should the load on the spindle motor increase above its rated load, the feed motor slows down. At 125 per cent load on the spindle motor, the speed of the feed motor drops to the minimum which is 175 rpm In the event, the load on the cutter is not relieved fast enough, the feed motor is dynamically braked to the minimum speed.

The use of the variable speed drive on this fin milling machine increased the production by 30 per cent as compared to a constant speed drive.

#### ARE YOU CONTEMPLATING A VISIT TO EUROPE OR LATIN-AMERICA?

Because a heavy increase in passport applications, particularly for European and Latin-American destinations, has affected its customary service, the State Department has requested applicants to file their requests well in advance. Six weeks is not too long.

In addition to many applications from private individuals, an unusually large number has come from government officials. The Passport Division also has been under great pressure from members of Congress and government officials to give preferred treatment to particular applications, with consequent delay to the growing list.

Then, too, instances have been noted where applicants arrange first for their rail and steamer transportation. A minimum of three weeks should be allowed for any passport.

The Passport Division is being given some relief. Heretofore, all passports of returning travelers were lifted upon entry into the country and were filed with the State Department. This system has been discontinued, except as to passports to military areas, and returning travelers will be permitted to retain their passports to the expiration of the original two years, with an option to renew for another two years.

#### TO POLICE INDUSTRY

If Congress provides the extra money—\$857,000—the Federal Trade Commission and industries will work together to eliminate any abuses that may exist.

At present, FTC may issue a ceaseand desist order against one company, while other members of an industry, in the language of the Budget Bureau, are left "free to follow that same practice until such time as the Commission issues an individual cease-and-desist order against each company."

But now the Commission proposes to move simultaneously against an entire industry on its own motion. When FTC would find evidence of unfair trade practices, all members would be investigated and those accused of using such practices would be proceeded against simultaneously.

The Budget Bureau's request for additional money from Congress said in part:

"Under the proposed program, greater emphasis will be placed on the elimination of unfair trade practices through cooperative means. In those instances where circumstances permit, industry members will be given an opportunity to eliminate unfair methods of competition through stipulation agreements to cease and desist or through the establishment of trade practice rules. Heretofore trade practice conferences have been held only when the Commission received a request for rules from an industry. The Commission now plans to initiate these conferences on its own motion where this means of eliminating unfair trade practices appears appropriate. This action by the Commission should permit more prompt, equitable and economic settlement of the issues involved than is otherwise possible."

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#### SIMPLIFYING WORM GEAR DESIGN

By H. F. Williams

FOR the design of worm and worm gear drives, and more especially for determining the direction of rotation of the worm gear, a simple method is herein illustrated. For a number of years I have had in my tool kit, a right-hand threaded screw and nut and an-

sideration will be given when the axes of the screws are in a vertical position as shown in the sketch.

The screw, in all the examples, is equivalent to the worm and the worm gear is represented by the nut. When rotating the screw, the direction of rotation will be as looking from above at the head end of the screw. It is assumed that the screw is in a fixed position vertically but free to rotate and that the nut move vertically, either up or down, but not rotatively. The screw

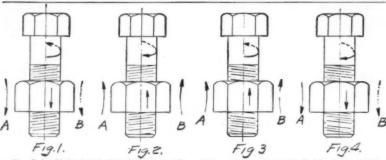


Fig. 1-A—Right hand threaded worm—the worm rotates counterclockwise. Worm gear at left rotates clockwise (nut moving downward).

Fig. 1-B—Right hand threaded worm—the worm rotates counterclockwise—Worm gear at right rotates counterclockwise (nut moving downward).

Fig. 2-A—Right hand threaded worm—the worm rotates clockwise (nut moving upwards). Fig. 3-A—Left hand threaded worm—the worm rotates counterclockwise. Worm gear at

left rotates counterclockwise (nut moving upwards).

Fig. 3-B—Left hand threaded worm—Worm rotates counterclockwise. Worm gear at right rotates clockwise (nut moving upwards).

Fig. 4-A—Left hand threaded worm—Worm rotates clockwise. Worm gear at left rotates clockwise (nut moving downwards)

Fig. 4-B—Left hand threaded worm. Worm rotates clockwise. Worm gear at right rotates counterclockwise.

other screw threaded left hand, also equipped with a nut. The eight possible drives in worm gearing are readily determined by "playing" with these screws and nuts.

The questions of design that must have been predetermined are:

1.—The hand of the worm—whether right or left.

 Direction of rotation of the worm -whether clockwise or counter-clockwise.

3.—Where is the worm situated in relation to the worm gear—to the right or to the left, or as will be explained further on—above or below. First contherefore becomes the driver member and the nut becomes the driven member.

If it is more convenient for the reader to read the sketch the other way, it is only necessary to turn this page so that the axes of the screws are horizontal instead of in a vertical position with the screwheads at the right. Then under Fig. 1-A, are direction would be:

Right hand threaded worm—worm rotates counterclockwise.

Worm gear above rotates clockwise. (nut moving towards the left).

Fig. 1-B—Right hand threaded worm
—worm rotates counterclockwise (nut
moving towards the left)

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| L   | Internal Cylindrical—Auto Sig.<br>Cantarioss        | Up to SE* Diam.                      | 144              |
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| X   | Perc-Bessie Sud-Bry                                 | Up to 24" Wheel Diam.                | 631              |
| Y   | Floor Comb. — Wet & Bry                             | 10" to 16" Wheel Green.              | 314              |
| Z   | Snog-Swing Frame                                    |                                      | 193              |
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| KEY | жасния                               | TYPE  | SIZE OR<br>CAPACITY                                      | AVAILABLE    |
|-----|--------------------------------------|---|--|--------------|
| 1   | Suring, Drilling & Million           | (Norisemel)   | Under 3" to 6"   | 309          |
| 2   | Saring & Turning Mills               | Verticel  | Under 36" to 126"<br>Swing                               | 483          |
| 3   | Boring & Yarning Fined<br>Rall Mills | Vertical  |  | 87           |
| 4   | Procision Suring<br>(Machines)       | Harls, bridge<br>single-and                             | Under 8" to 14"  | 484          |
| 5   |                                      | Harts, bridge—<br>deckie end                            | Under 8" to 14"  | 2204         |
| 6   | Deffici                              | Bax column—<br>ologie spindle                           | Under 1/2" Cop. )<br>Up to 22" Suring                    | 287          |
| 7   |                                      |   | 1/5" to 1" Cap.  | 187          |
|     |                                      | Round column—<br>single spindle                         | Under 1/2" Cop. )<br>Up to 23" Swing?                    | 798          |
| 9   |                                      |   | 1/5" to 1" Cap.  | 1148         |
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| 12  | 1                                    |   | 1" Cap. and over 1<br>34" Swing & over                   | 434          |
| 13  | 1                                    | Sanultive Fleer &<br>Pedestel Round cel.                | Under 1/5" Cop. 12" to 22" Swing                         | 204          |
| 14  |                                      |   | V <sub>2</sub> " to 1" Cop.<br>Under 10" to 34"<br>Swinz | 1131         |
| 15  | 0- <b>6</b> 0                        | Sanottivo Flaor &<br>Padestel Upright Type<br>-Box Col. | Up to 38" Swing  | 349          |
| 16  |                                      | Specitive Floor &<br>Padestel Upright Type              |  |              |
| 17  |                                      | Bound Col.<br>Houvy Mfg. Type                           | Up to 38" Suring<br>Up to 33" Suring                     | 161          |
| 18  |                                      | Spec. Kingebury<br>Way & Vertical                       |  | 280          |
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| 21  |                                      | Single Spindto—Harts.<br>Turret Type                    |  | 200          |
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| 23  |                                      | Molti Spindle—Vertical<br>(6 and 8 spindle)             |  | 301          |
| 24  | Checking Muchine                     | Auto, Batwaon Conters<br>Hartz, Single Spindle          | All sipes  | 2024         |
| 25  | Sorow Machine                        | Acie-Ber-<br>Single Spindle<br>Auts-Ber-S Spindles      | Up to 11½° Cop.  | 1978<br>1915 |
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| 36   | 1   | Auto.<br>Throud—Auto.—                        | Up to 30" Cap.                | 334              |
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#### **VETERANS AND INDUSTRY**

By SIDNEY MARLIN
Veterans' Counselor, Caterpillar Tractor Co.

HERE has been so much written and said about veterans, that the public is beginning to think of them as problems. This is not as it should be. The overall picture of the veterans' return may pose a problem for industry if they are not ready for it, but the individual veteran is not a problem. Because he is an individual, he will have his own personal problems the same as we all have; there may be a few who need vocational adjustments and some in need of social rehabilitation, but remember-the vast majority will return ready and eager to again assume a gainful occupation. The veteran will be a problem to industry only if we are not ready for his return.

Most important in the successful handling of the servicemen's return is the attitude taken by industry. We at "Caterpillar," feel there are three main points which must be the guide for our actions. These points are: (1) common sense, (2) sincerity and (3) individual, but no special treatment. The plan being used by "Caterpillar" at present is not the final answer. We recognize that the pattern of the returning serviceman has changed and will change again, and we will change our plan as the need arises.

When the veteran returns to "Caterpillar," he is directed to the veteran interviewer. The purpose of this interview is to find out the various interests, desires and capabilities of the individual serviceman so that he can be placed properly in a position with our company. The possibilities of training, returning to full-time school or assuming regular work in our organization are all discussed with the veteran.

We often find that the individual man is of such a mental and physical makeup that he would not be suited for industry. In these cases we attempt to sell him on the idea that he would

"The spirit of America is the spirit of independence. Americans are typified by our fighting men. They seek no favors: they ask only for the right to make their own way. They want only one assurance, the right to work out their own destiny. They deserve that right, and we are determined that they shall have it. Government alone cannot do the job-private industry must cooperate. By pooling the vast resources of our country, we can make it possible for every returning service man and service woman to find a job. They do not want a dole. They ask only the right to continue and improve our American standards of living."

#### HARRY S. TRUMAN President of the United States

be best suited for some other type of work in which he would be much happier.

The veteran presents his discharge papers, and is asked to give us a history of his military experience. Any schools attended or training acquired in the service which better qualifies him for our particular line of work are given due consideration in final placement.

If we feel that the individual would be contented and happy in the type of work which we have to offer at "Caterpillar," he is then directed to the Medical Division for a complete physical examination. At "Caterpillar" we have a full-time doctor who devotes all his time to interviewing, examining and counseling with the veterans. In order to eliminate any unnecessary waiting, the veterans' interviewer make a def-

inite appointment with the doctor for each veteran. In his interview, the doctor determines whether or not the man has any emotional problems, and he attempts to determine the emotional stability of the individual so he can better anticipate any latent characteristics which may later manifest themselves in the veteran's actions.

The doctor classifies the individual in one of three groups—the first group being the individuals qualified for any type of office or factory work, the second group, those physically qualified only for a specific job, and the third group, those who are physically unfit for work at Caterpillar Tractor Co. Individuals placed in Group II are approved by the Medical Division for a specific job and no job changes are made for employees in this group without the consent of the Medical Division.

After we have received the proper classification from the Medical Division, he is then placed on the job according to his physical and mental capabilities or limitations. Proper placement of the

individual on a job is a primary factor in determining the degree of success which the individual will have in his work.

In cases where individuals on a military leave of absence from the company return with serious physical handicaps, the department in which they formerly worked has usually been successful in properly placing them. However, if the department where the veteran previously worked does not have a suitable job for him, he is turned over to the veterans' interviewer for proper placement. Through plant-wide surveys which have been made at "Caterpillar" the veterans' interviewer knows where handicapped men and women can be utilized. These surveys have greatly simplified placing handicapped people and to date we have been successful in quickly placing everyone of our veterans who have returned to us.

Our Training Department with their vestibule training shop helps a great deal in cases where skilled men have been away from their machine or work



266

bench for a long period of time and would like an opportunity to take a "refresher" course to regain their skill and confidence. This also proves valuable to individuals who, because of various experiences in service, are not able to immediately adjust themselves to an eight-hour work day.

In the vestibule shop the veteran does not have to worry about production. The noise is less intense than in the shop and he is free to go home or to the classroom or the training library if he feels he cannot finish the day at his machine. The average length of time spent in this vestibule is approximately three weeks. They are transferred to the various production shops from this vestibule school.

The success of the placement of veterans at "Caterpillar" is due to the splendid cooperation and interest of all people concerned in supervision, Medical, Personnel, Safety and Training.

Placement of handicapped civilians and for veterans who have not worked at "Caterpillar" is the same as outlined above in departments where there is a definite opening.

Once a man has been placed on a job—a job which is within his ability, he is then expected to do his part. He will be paid the same wage that any other individual would be paid on that job whether they were handicapped or not, and he will be expected to do a day's work the same as any normal individual working in the plant.

In expecting industry to assume its share in the placement of returning servicemen, it must be remembered that industry alone is not the complete answer. Many individuals will not be able to adapt themselves to factory work. These men, if placed in industry would only be dissatisfied with their work, and would be unhappy. Therefore, the job of counseling the returning servicemen may involve the job of salesmanship in encouraging the man, who does not belong in industry, to go to other fields.

Many questions have arisen as to what we will do with the high school boy,



who has had no previous employment experience, or the storeroom clerk, who has entered the service and has become a senior non-commissioned officer or officer; many having risen to the rank of major-these men will be most difficult to place because their individual abilities usually do not qualify them for an equally responsible job in industry. These men must be made to realize that they must again go to school or be willing to accept positions where they will learn to do work which would qualify them for the positions they desire. In many cases it will be necessary for these men to take a substantial cut in their wages in accepting this position in industry with lesser responsibility. Many of these men who acquired family responsibilities will find this difficult to do.

Every case must be handled on its own individual merit and no set plan can be laid down to cover even the smallest majority of these cases. Returning servicemen should be a community project, particularly those returning from service with physical or mental handicaps. "The Peoria Plan," a community project, has helped to place those boys who are not suited for industry, and also to assist all veterans in their questions concerning insurance, job information, veteran benefits, further education, housing and any other questions they have in their civilian adjustment. We at "Caterpillar," are making every effort to place our returning servicemen, regardless of physical or other handicaps acquired in the service. We feel that industry should make every attempt to place their own men.

The success of the plan for returning servicemen is primarily dependent upon the supervision from top management on down. They must be informed about it and back it 100 per cent. The most important man will be the individual foreman who directly supervises the veteran as he is in the best position to watch the man and help him with his individual adjustments. "Caterpillar" expects their supervision to be more

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than an individual who gets work done. There is more to the job than just recognizing deficiencies. As well as recognizing a problem, he must be able to arrive at a solution or send the man to the proper place for further assistance. The foreman is with his men eight hours each day, and is in an excellent position to be the motivating factor in encouragement and direction.

For the men who have served their country, the service has done at least one thing—made them better Americans. Shouldn't we of industry help them maintain that attitude by making every effort to afford them the opportunities they so earnestly desire and

deserve?

#### TODAY'S ORDERS NOT DUPLICATES

Today's expanded buying of electric motors, generators and controls represents little or no duplicating of orders for equipment which will later be cancelled, in the opinion of district managers and field sales engineers of the Reliance Electric & Engineering Company, meeting recently in Cleveland for their first general sales conference since Pearl Harbor.

Major factors in securing current new business are the urge on the part of many manufacturers to expand quickly the production of products regularly made before the war and the growing realization of plant managers that without replacing present equipment they cannot obtain the speeds now feasible

with new materials.

A shift in production by some concerns to new or substantially redesigned products is offered as another reason for the present buying of new motor driven machinery. A trend toward automatic or semi-automatic operations requiring more motors and control is another factor of importance where new electric drives are being added to present plant equipment.

Where new motor drives are being purchased to replace older ones, the controlling reason appears to be, according to the survey, that production



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managers are becoming more "adjustable speed" conscious, more aware that there is no one speed which is the right speed for all operations a machine may be called upon to perform. This is especially the case in the company's Los Angeles territory, as well as in that part of the East served by the Philadelphia and Syracuse offices. "Spot conversion" of electric power—using an alternating current source and converting to direct current on the spot where adjustable speed is required—is increasingly evident, the survey indicated.

The Cleveland, Chicago and Houston areas appear equally interested in the extent to which the installation of new motor-drives can cut manufacturing costs. Detroit's very substantial buying of alternating current motors seems to be in anticipation of future rather than present requirements. Pittsburgh and Cincinnati are most concerned with obtaining new motor drives for modernization of existing facilities. Customers in the company's New York area are in the forefront of those ordering machinery for the production of entirely new products. Boston carries this trend a step further by exhibiting especial interest in new electronic devices recently developed for increasing accuracy of control of adjustable speeds.

#### MANUAL FOR SUPERVISORS

"How to Evaluate Supervisory Jobs" a manual by Albert N. Gillett is directed toward an important current problem. With the status of foremen of vital concern to management, this new manual provides detailed answers for the two key questions: What is the supervisory job worth? How good is the man occupying that position.

The manual has three sections. Part I explains and describes the Job-Analysis-Rating-Evaluation of Supervision method, which enables management to determine how much the job itself is worth in either hourly rate or salary range.

Part II is devoted to a detailed description of a definite plan by which management can determine the weak and strong points of the individual occupying the supervisory position.

Part III supplies the reader with a working kit of blank forms for running his own tests, 22 forms in all.

#### Foremen, Profits and — Labor Relations

Here is food for thought for all of us. Forest D. Siefkin, vice president in charge of industrial relations and general counsel of the International Harvester Co. of Chicago believes that: "Whether top management fails or succeeds in its labor relations policies is determined by the ability of the foreman, and the relationship that exists between him and his employees."

Mr. Siefkin was one of five speakers at a recent general management conference sponsored by the American Management Association. Other points emphasized at the meeting, which was attended by about 600 persons, were that profit sharing is no substitute for "frank and equitable adjustment of differences," and that company policy must be known and understood by everyone in an organization. Two case studies, presented by executives of General Electric and General Foods, showed what they were doing to give young managerial employes a well-rounded knowledge and understanding of their complex businesses.

#### Choose Foremen Carefully

Elaborating on his contention that foremen are the keystone of a sound labor relations program, Mr. Siefkin said that they should be selected not only for their mechanical ability but also for interest in their work, intelligence and personal social characteristics. He further recommended that the foreman be thoroughly versed in corporate policy so that he can "manage his employes and not his machines."



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#### **Profit Sharing Plans**

In a talk about profit sharing, Edward S. Cowdrick, New York industrial relations consultant, asserted that "profit sharing should not be grafted upon a wage scale not fully up to accepted standards. Nor should it be used as a shock absorber when government and public sentiment is disposed to criticize excess earnings of capital."

Pointing to recent survey which indicated that 1,000 to 1,200 profit-sharing plans had been established throughout the world within the last 125 years and that at least 60 per cent were discontinued, he said the reason was "mainly apathy of employes, or employer dissatisfaction with results."

#### Results and Remuneration

He declared that profit sharing is desirable for policy making executives whose efforts can be measured by company earnings. It would be better in the case of operating executives, supervisors and rank and file employes, however, to base incentive payments on measurable results rather than on profits, he continued.

The opinion of many workers, he said, is that there is little sense in increasing output if the only reward is to come months or years later and then to be measured by profits which rise and decline because of management action or economic conditions over which the worker has no control.

Experience shows that in many cases employes come to consider shares of the profit as a part of wages and feel aggrieved if they are reduced or discontinued, he added.



# FEET AND LEGS FOR JIGS AND FIXTURES

By H. F. Williams

**B** EFORE the advent of welding in the machine shop, as we know this commonplace operation today, the feet of jigs and fixtures were merely protrusions from the main plates or bodies of the assemblies.

If the piece was skirted, a foot, as illustrated in Fig. 1, usually resulted. If indeed the feet were to be low in height, the tool steel plate was milled away to leave four small blocks or squares in the corners. These became the points upon which the jig rested

when being used.

When the fabricated jigs made their appearance, through the use of gas or arc welding, the foot projections were attached, heated and cyanided for proper hardness. If, however, there was much unevenness at the bottom of the feet, too much material had to be ground off, thereby leaving a soft resting surface.

The modern method makes use of hard-facing material. In Fig. 2, Stellite has been puddled on the ends of the legs, sufficiently thick so that the feet can be ground off to the proper dimension. The feet are simply pieces of square steel stock of low carbon con-

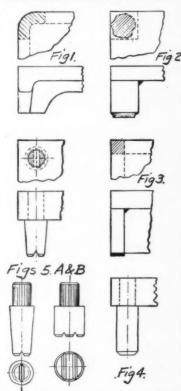
tent.

In Fig. 3, a small piece of tungsten carbide is brazed to the lower surface of the fixture skirt. Carboloy, Firthite, Kennametal or similar materials can be used. Because of their extreme hardness and resistance to abrasion, only

thin wafers need be used.

A number of years ago, it was the practice in one shop to make jig and fixture legs of drill rod, properly heat treated. These legs were made in two diameters, both straight as shown in Fig. 4. The ends were chamfered generously for a later grinding operation. The smaller diameter was ground after hardening, but it was hard to maintain a square shoulder because of its small height. This small diameter was ground to a press fit. After three or four legs, depending on the design of the fixture, were assembled, the fixture was turned

up side down and the faces of all the legs were ground simultaneously, care being taken not to take off too much of the chamfer. Of course, the holes which accommodate the smaller di-



ameter of the legs, were reamed to a tolerance for proper press fit. These legs were made up in lots of various diameters and lengths and kept in stock.

There are available on the market today, standardized legs and buttons for the use of jigs and fixtures. Rolyan Metal Products of Chicago have added several novel improvements to the press-in leg. These are shown in Fig. 5A and B. The shanks are straight-





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knurled, a feature which eliminates the necessity of reaming the holes into which the shanks press. The holes need only be drilled. These legs and buttons are interchangeable and thus can be used as standardized equipment. Because they can be bought as stock items, the draftsman does not have to draw them. Machine time is also saved. The bottom surfaces are grooved as shown, a feature to consider where chips are numerous as the grooves provide chip clearance. Not only are they hardened and ground but also chromium plated, which adds an extra protective skin to guard against abrasion and consequent wear. They are made in a range of sizes and lengths. A full scale dimensional print is available which can be used as a template when laying out the fixtures.

Because of the wide use today of jigs and fixtures in one of the important methods of reducing costs of the finished products, the tool should be designed for standardized jig parts. Uniform shapes and sizes can be stocked to facilitate delivery.

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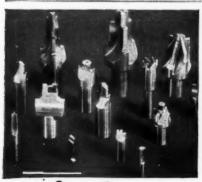
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# WHAT'S NEW IN METALWORKING

#### MULTI-SPINDLE TAPPING MACHINE WITH INTERCHANGEABLE HEAD

A new tapping machine development has been introduced by Motor Tool Manufacturing Company, 7777 Cortland Ave., Detroit, Mich.

The feature of this new bench type machine lies in the fact that its multispindle head is interchangeable. Head and spindle assemblies are built and sold as a complete unit, each specially designed and constructed to perform specific tapping operations.

These head assemblies can be quickly and easily attached or detached. Any number of spindles may be incorporated in the head, in any pattern, provided they are confined to a 10"x12" area. Center distances, between spindles, can be held as close as 1".

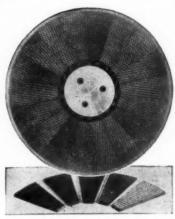
Heads are so geared that a uniform flow of power is delivered to each individual spindle and tap. All gears are specially hardened and operate in a bath of oil, fed by a continuous-flow, motordriven oil pump. Each spindle likewise is hardened and ground, the thread of which runs in a bronze bushing. Operating speed is optional, in a range from 220 rpm to 760 rpm as standard for each tap. This, however, can be varied either higher or lower, according to requirements, by simply changing the stepped pulley.

#### DISC FILE FOR FACING

Kennametal Inc., Latrobe, Pa. is now producing a disc file for use on light alloys, die castings, and plastics. This new tool is designed to facilitate the facing of rough castings, and removing of unwanted projections, such as flash or draft, gates, risers, etc.

It consists of double-cut segments of solid Kennametal, securely dovetail-wedged into a 12" diameter steel body which can be supported and driven by any suitable means. The teeth are formed and positioned so that the material is

sheared off in clean-cut chips, similar to the action of Kennametal metal-cutting tools.



The file body may be attached direct to a rotating member of the driving machine, by socket head cap screws, if it has a suitable supporting flange and centering stud. If such means are not available, a flanged adaptor may be made.

#### LEWIS ELECTED PRESIDENT

W. Luther Lewis, who has been executive vice president of the Chicago Pneumatic Tool Company since 1931 was elected to succeed Mr. H. A. Jackson as President.

Mr. Jackson, Chairman of the Board of Directors for fourteen years, and president of the company for twenty-eight years, was today re-elected Chairman of the Board of Directors, and at the same time, at his own request, he relinquished the position of president of the company.



Point-of-view can be more than an opinion, just as the piano expert crawls under a piano to check the number of plies in its case, the bracing and construction, just so "trick" angles reveal the true value built into a lathe — the bracing of the bed, whether the apron has a full double wall, a half back wall or no backwall, the type and size of back gears, ways, the size and finish of the spindle, etc., etc.

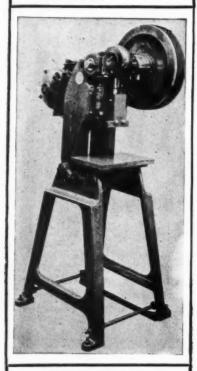
In selecting a lathe, look at it from any angle  $\dots$  and, before you buy, see the SHELDON, it's a good lathe from any angle.



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Immediate Delivery \$450 F.O.B. Hartford Less Motor



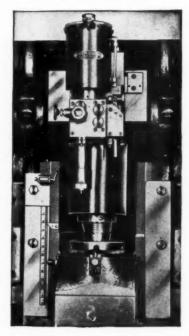
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#### HYDRAULIC OVER-LOAD PITMAN

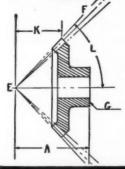
To overcome the overloading of the average punch press in sizes from 30 tons and up, a Hydraulic Over-load Pitman replaces the standard pitman or connecting rod usually furnished with punch presses. This hydraulic linkage not only prevents bending of the crank shaft and throwing other strains on the frame of the press, but also can be arranged to protect severe over-load on the dies used in the punch press.

This over-load safety device is usually set to protect the maximum rated tonnage of the press, however, it may also be adjusted to protect any given tooling that is considered to need the necessary minimum protection. The over-load valve may be adjusted to any desired pressure and sealed to avoid tampering.



Should the press become over-loaded by any cause whatsoever during the work cycle, the piston retreats against the high pressure chamber The increased pressure thus caused permits oil to escape

#### Here's the Problem



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Drill jiqs, piercing dies, molds,

Drill jigs, piercing dies, molds, templates, metal patterns and machine parts demand an accurate relationship between a series of holes—as well as close tolerances between the centers of these holes and other points. The Center-Locator, with its powerful magnifier, performs this function quickly and accurately. How it operates: Lay out work with height gauge, locate center through the magnifier — then replace magnifier with any of 16 drill bushings furnished. Ask your mill supply house, or \$34.00 postpaid.



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through the over-load valve into the reservoir. This action automatically reduces the pressure in pressure chamber and, therefore, the required pressure has to be reestablished by hand actuator before the press is ready to resume its operation.

Once the working ram is set for a given tool its position remains constant at all times, by the high pressure applied on cylinder, which is maintained through the dribble pump and is actuated by the cam on the throw of the press. For further information, write Dayton Rogers Mfg. Co., Minneapolis, Minn.

#### SOLID CARBOLOY CUTTER BLADES

A recent development of the Super Tool Co., of Detroit, Michigan, is a face milling cutter, using solid carboloy blades, according to H. E. Berry, sales manager.

Only one type of body is required for machining all materials, the only variation being in the angles ground on the solid carbide blade, which can be readily altered to suit any specified material.



"An outstanding feature of the tool," said Berry, "is that it permits the use of unbrazed carbide metal which is generally conceded to be definitely superior as to grind life as well as vastly more rugged in resistance to cracking, chipping and breakage than a brazed tool or blade."

The solid carbide blade is held in the head or holder by a wedging device. This permits the carbide blade to be adjusted for wear and use of the maximum possible portion of the blade. Simple jigs can be obtained for the easy sharpening of the carbide blades to suit all types of work.

These cutters are available in 6", 8", and 10" diameters, in both right-hand and left-hand, as standard tools.

### DRAWING BOARD INSTRUMENT

A new drawing board instrument for use in the machinery field is announced by Rapidesigns, Inc., of Glendale, Cal.

Working on the stencil principle, this instrument embodies templates for standard gears, rivets, drill points, countersink points and either Phillips Head or Reed and Prince Screws.

The instrument is made from transparent heavy gauge, laminated plastic sheets, with the markings inlaid between laminations so as not to rub off.

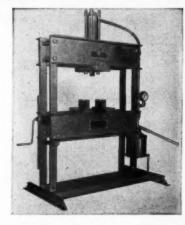
The device gives screw and rivet head sizes from 3/32 to ½"; drill point and countersink angles 62 78 100 and 118; involute gear teeth No. 10 to 2; and rack gear sizes 13 to 3.

### 60-TON SHOP PRESS

A new shop press of sixty tons capacity is announced by Rodgers Hydraulic Inc. of Minneapolis, Minn. Features of the press, called the Rodgers "Sixty," are fast operation, ruggedness, versatility, and large capacity for work size.

Flexibility of the press is achieved through adjusting the lower bolster by means of a hand crank. Maximum opening between bolsters is 38", minimum is 8". A special model with an opening range

from 8" to 48" is available. Although working width between the sides is a generous 45", long pieces may be handled



through the open sides any place above the globe valve and pump.

# CUT ANY SHAPE BETTER with BEVERLY Throatless SHEARS



The No. B-3 BEVERLY Bench Type Shear with Ball Bearing Hold Down handles 3/16" or No. 10 gauge stainless steel. This sturdy shear weighs 58 lbs. and is equipped with H. C. H. C. Blades for heavy duty service.

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THE BEVERLY SHEAR MFG. CO., 3005 W. 110th Pl., Chicago 43, III.

A machined and matched pair of V-blocks is furnished as standard equipment. Special attachments for ring gear riveting and for aligning and centering shafts, rod, etc., are available, as well as an end support stand (adjustable) for handling long material.

General shop operations are easily performed by the Rodgers "Sixty," such as: pressing, straightening, shearing, bending, clamping, riveting, broaching, and assem-

bly work.

### DEW POINT INDICATOR

The Illinois Testing Laboratories, Inc., of Chicago, Ill., have announced the development of the Alnor Precision Dew-Point Indicator, Model 8. It is an instrument for the determination of dew-point, relative humidity, grains moisture per pound, and latent heat of non-corrosive gases.

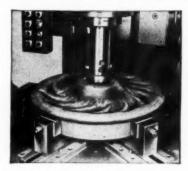
The indication takes place in an enclosed observation chamber under conditions which can be controlled and re-

produced.

Operation of this unit is simple and direct and the instrument is a complete unit, completely portable, and not requiring external cooling means or auxiliary apparatus.

### RAILROAD CAR WHEEL BORING

This special-purpose, automatic-cycle machine for rough and finish boring wheels for railroad cars is designed and



built by Snyder Tool & Engineering Co., 3400 Lafayette, Detroit 7, Michigan.

On steel wheels, the cutting time for finish boring 1/8" stock per side is 1 minute 20 seconds for a hole 7" long and 7" diameter, the same amount of stock



A powerful, fast-cutting tool, streamlined in design, easy to handle. Designed for real production work and the toughest jobs. Precision made, excellent balance. Special grease-sealed bearings . . no lubrication required. Fitted with steel housing, a special safety feature.

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is removed from cast iron wheels in 50 seconds. Cutting tools are T. C. tipped.

Chamfering and facing a 1½" flange may be performed simultaneously with the boring operation. A 19" stroke is provided so that rough and finish boring may be performed in succession.

Spindle feeds are from 2" to 24" per minute and various spindle speeds are provided through the use of a four-speed selective transmission or a variable speed motor. Spindle is heavy-duty with taper roller bearing mounting.

The table travels upon V-ways, casehardened, ground and automatically lubricated and the travel is by hydraulic actuation with 5-second time interval.

Work is held by two 5-jawed chucks of 42" capacity, operated by individual hydraulic cylinders. Work-cycle is automatic. Capacity is 20 hp. for a finishing machine and 30 hp. for a roughing machine.

### GAS TURBINE TEMPERATURES

The gas turbine, powerful combustion engine which since development has refused to have its temperature taken, has been forced literally to take its own temperature by General Electric engineers thru use of a special metal alloy which tells temperature by color.

The alloy, a chrome cobalt composition, shows a marked color change for every 25° change in temperature from 500 to 700°C, then reverts back to its original color and begins the color scale over again in a higher range of from 725 to 900°C (1652°F). This is believed to be the highest temperature ever recorded accurately inside a gas turbine.

The temperature-taking alloy, according to G-E engineers, turned the tables on the gas turbine after practically all types of temperature measuring devices had failed to record faithfully the intense and varied heat created by the turbine wheel, which whirls more than 1000 mph.

By making turbine parts of the alloy, the turbine has no alternative but to take its own temperature. Following operation, the turbine has to "show its colors," and by doing so also has to show its temperatures reached during operation, according to the engineers.

The chrome cobalt alloy, like most metals, changes color when being oxidized under heat. Unlike other metals however, this alloy oxidizes so slowly at higher temperatures that each color change occurs regularly at 25° intervals thus permitting an actual graduated color scale according to temperature.



\*Stock carried at these locations

ACCURATE BUSHING COMPANY, 440 North Ave., GARWOOD, N. J.

WEstfield

But the strangest characteristic of the alloy, according to G-E engineers, is that after it completes one order or scale of colors, it reverts back and repeats these colors in a second order in a second, higher range of temperature.

On the basis of one hour heat treatment, the alloy at 500° C turns a light straw color, at 525 a straw color, at 550 a bronze color, at 575 purple, at 600 dark blue, etc. The alloy turns light blue at 700°C and according to all precedent, it next should turn grey, indicating the end of the color scale.

Instead of turning grey however, the alloy at 725°C reverts back to a light straw color and begins the progression of colors over again. The alloy turns light blue in the second scale when it reaches 900° and begins to show greying tendencies at 925° the engineers report.

Interference colors of the alloy change as the thickness of the oxide film changes, until the oxide film becomes so thick or irregular that no color is transmitted thru it to be reflected. At this point, indicated by a dull grey surface, oxidation has run its gamut of colors, and the metal is no longer useful as a yardstick for measuring temperature.

Demonstrating just how fine a change actually takes place the film of oxide on the alloy increases in thickness only 2½ billionths of an inch at every 25° change in temperature. By comparison, 12,000 such thicknesses would be necessary to attain the thickness of a single sheet of ordinary writing paper.

### LIGHT WEIGHT BLOWER

A new light weight blower for heat dispersion, the Model No. 2½ has been added to the line of the L. R. Manufacturing Co., Div., of The Ripley Co., Torrington, Com. The one piece housing with aluminum motor plate is 4½" from top to bottom. Operating under all conditions of climate and temperature the unit which weighs but 3½ ounces delivers 50 cfm at 8000 rpm. It is available with shaft bores of either .1895 inch or ¼ inch.

With the addition of this new model to its line the L. R. Company now has available blowers ranging in size from 3" to 6½" with weights from 2 ounces to 12 ounces and with capacities ranging from 15 cfm to 270 cfm at 8000 rpm. Housings are light weight, high impact phenolic plastic. The wheels are turbo-type cadmium plated steel, available in either clockwise or counter clockwise rotation,

# NEDCO Electric SANDING—RUBBING MACHINES SOLVE YOUR SURFACING PROBLEM



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This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

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|----------|-------------|--------------|--------|
|          | Jaw, Inches | Inches       | Pounds |
| 1D<br>2D | 31/2        | 31/4<br>51/4 | 121/2  |

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| Jows | Jows | Open | Pounds | Opening | Factory |
| 150 | 1½" | 1" | 1½" | 6½ | 1" | \$18.75 |
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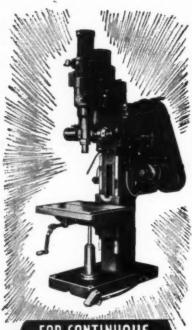




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Kaufman No. 10A HI-Duty single spindle Lead Serew Tapper made in 3 HP and  $1\frac{1}{2}$  N.C. threads in alloy steel.

This Hi-Duty Tapper offers these features: Fully enclosed . . . lead serew and nut operate censtantly in oil bath . . . positively wear-proof clutches instantly engaged and controlled by air cylinder . . . quick traverse when not actually cutting threads . . . accurate depth centrol . . centrol to protect tap overlead, and further protected against jamming if work is placed in upside down . . . class 3 fits always assured and perfectly controllable. Complete information upon request.

KAUFMAN MFG.CO.

### CONVENIENT MAGNIFIER

A "Super Sight" Headloupe Model No. 502, supplied with a lens system in either of two powers, is announced by the Boyer-Campbell Company, 6540 St. Antoine Street, Detroit 2, Michigan, Worn



with or without glasses, it is supplied with bracket permitting the lens system to be set in any position for ease of the operator The flexibility of the mounting permits lens holder to be moved in or out, up or down. With equal ease, it is pushed up out of vision when not needed.

### BRUNING BW-COPYFLEX PRINTER

New reproduction advantages—as well as double utility—are offered by a machine recently announced by the Charles Bruning Co., Chicago. This machine, the BW-Copyflex Model 2 Continuous Printer, makes it possible to duplicate anything drawn, typed, printed or illustrated, as well as to make BW Prints, providing complete reproduction facilities for any type of industry or business.



This exposes, with the use of Copyflex materials, tracings, line drawings, specifications, Van Dyke negatives, blue prints,

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### SET OF 19 DOES THE WORK OF 209 SOLID ARBORS

Nicholson expanding mandrels cut costs 2 ways: first, by saving the time lost in making or looking for solid arbors; second, by promoting precision. Hardened tool steel, accurately ground. Two types. Sold singly or in sets, Bulletin 1043,

W. H. NICHOLSON & CO.

117 Oregon St., Wilkes-Barre, Pa.

TYPE A-STEP JAW DESIGN

| Size No. | Range of<br>Bores Taken | Length Overall |
|----------|-------------------------|----------------|
| IA<br>2A | 1/2" to 1"<br>to 1/2"   | 9"             |
| 3A       | 11/2" to 2"<br>2" to 3" | 121/4"         |
| 5A       | 3" to 4"                | 21"            |

#### TYPE B-STRAIGHT JAW DESIGN

| Size Na. | Range of<br>Bores Taken | Length Overall |
|----------|-------------------------|----------------|
| IX       | 1/2" to 3"              | 500            |
| 3X       | 21/32" to 34"           | 6"             |
| 60       | 7/a" to 1"              | 81/4 **        |
|          | 11/4" to 11/4"          | 1136           |
| 8        | 1A" to 2"               | 13%"           |
| 4        | 2" to 21/2"             | 171/4"         |

(Other sizes taking up to 7" bores.)

MILLING - DRILLING - BORING
ATTACHMENT 101 Persons

Photo shows a special operation not sulted to standard straddle mill set up but easily handled by means of a RUSNOK Milling attachment used horizontally on a standard milling machine, saving one machining operation and accomplishing greater accuracy in finished piece parts. Uses many types of cutters on a wide range of work. Easily mounted—tilts to any angle. Large size spindle (No. 9 B & Taper). Takes 1,1 to 3/4" end mills. Large quill with 4" travel, counter balanced, hardened and ground. Six speeds 250 to 3000 RPM. Lever and worm feeds. ½ h.p. motor. Specially engineered by RUSNOK to meet modern demands for high precision, heavy duty end mill operations.

Prompt delivery.

Prompt delivery.
Write for illustrated circular and prices.

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RUSNOK TOOL WOR

4840 WEST NORTH AVE.

CHICAGO 39. ILL.



For VOLUME TYPE Blowers

JANETTE has been a leader in building exceptionally rugged steel blower wheels. They efficiently deliver their rated volumes of air with a minimum of air noise and power consumption.

Our unique, PATENTED construction ensures equally spaced, die cut blades that will positively stay tight.

It is an incongruity to build a high quality product, then use other than the highest quality wheel obtainable. Try Janette Wheels and you will discover why they are so popular with manufacturers of coal stokers, oil burners, air cooled engines, hair dryers, dust collectors, motorized blowers, air conditioners and the like.

ASK FOR BULLETIN 24-1

Janette Manufacturing Company 556 W. Monroe St. Chicago 6, Ill

etc. Original material with copy on both sides can be reproduced on either side or both sides. Copyflex Prints are developed in trays and dried in a simple drier. With the flick of a switch, the Model 2 becomes a BW Printer for exposing black and white prints.

Another new Bruning machine—the Model 153-M BW Developer is used for developing BW Prints exposed on the Model 2. Prints are delivered ready for use.

Copyflex Printer fits in desk-top space. It exposes roll stock or cut sheets up to 24" wide at a speed of 5" to 30." per minute. Because it is a continuous printer, speed of reproduction is considerably increased.

### EXTERNAL THREAD CHASER

To the standard tool holders available for the Retract-A-Tool for external or internal tools, the Foulk Engineering Co., 4208 Airport Road, Cincinnati 26, Ohio, has added a formed threading tool arrangement for chasing external threads only.



The formed threading tool has four cutting edges and can be obtained in any of five standard sizes with the proper flat on all edges or with one edge arranged for each thread range. These new tools can be sharpened off hand on any tool grinder and readjusted to the proper center height by means of a stake adjusting screw.

Two sizes are offered: 15%" diameter for the No. 1 size Retract-A-Tool and 21%" diameter for the No. 2 size Retract-A-Tool.

The Retract-A-Tool automatically snaps the tool away from the work at the end of each threading cut at precisely the same point. This allows increased spindle speeds without danger of the tool digging into the work at the thread ending. Plain Type

TRADE AU



MARK

Offset Type

TINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET.

AUTO MOULDING & MFG. CO.

1110 E. 87TH ST. CHICAGO 19, ILL. SPECIFICATIONS: Open Width %\* to 6\* Gage Material .040 to .125 Pin Diameter .101 to % Lengths to 120\*

SEMI-OFFSET

### ENGINE DRIVEN WELDER

This light weight full capacity 200 ampere "Simplified" engine driven are welder is the first postwar model to be announced by The Hobart Brothers Co., Troy, Ohio. Completely enclosed in a compact steel canopy with hinged side panels and powered with 26 hp. four cylinder engine for economical operation, this new unit has a range of 40 to 275 amperes.

Multi-range Dual Control of welding current makes it easy for the operator to adjust voltage and amperage relationship to the fine degrees that are required. With 10 ranges of welding current and 100 steps of volt-ampere adjustment in each range, the Hobart Multi-range Dual Control makes available 1,000 combinations of open circuit voltage and welding current for selecting any desired are characteristics.

Remote Control allows the volt-ampere adjuster to be easily removed from the control panel for use with an ordinary extension cord so that the operator can adjust the welding heat right at the work.

Standard equipment also includes the mercury type idling device which automatically idles the engine when not in use.

#### CARBOLOY-TIPPED END MILL

The Nelco Tool Co., Inc., 370 Hamilton Ave., Brooklyn 31, N. Y., announces the development of a Carboloy-tipped 3-flute End Mill. The new device is said by the manufacturer to be the first really successful Carboloy-tipped end mill capable of plunging into solid metal. They say it is equally efficient in the milling of plastics.

According to the manufacturers, in the milling of a "keyway", the 3-flute end mill finished the job much smoother and in one-sixth the time consumed in milling the same piece with a high-speed steel end mill.

The new end mill is manufactured for use on all types of alloy steel, cast iron, brass, bronze, and plastic material. Sizes range from \%" to 2" diameter.

### NEW DRILLING MACHINE

A 20" drilling machine has been announced by the Sibley Machine and Foundry Corp., South Bend 23, Ind. The unit is standard with motor drive and belt guard or, where it is necessary to operate the machine from a line shaft, with tight and loose pulley drive. This machine is especially designed for drilling up to 1¼" in cast iron, or the equivalent



ADJUSTABLE HOLLOW MILLS

16 standard sizes—Cutting capacities 1/32" to 2". Also specials made to order.

The KUTMORE is the only hollow mill with built-in micrometer dial adjustment. Prompt delivery — even on specials. Write for Catalog No. 15.

CARL WIRTH & SON, 1625 Clinton Ave., N, Rochester 5, N. Y.

in other metals. Rotary geared coolant pump and geared tapping attachments

also are available.

Machined part of the main column is 5¼" in diameter. The drill table rotates on an arm which swings on the column to provide maximum working space. Both power and hand feed are furnished. Adjustment is provided for wear between worm and worm gear. On the motor drive unit, the motor is mounted on a pedestal, supported by a rigid base cast integral with the machine. V-Belt is adjustable through hinged motor mounting plate. Features of the new 20" Drilling Ma-

Features of the new 20" Drilling Machine include wide interchangeability. Spindle quills are furnished with bronze oil-grooved bushings, and the Morse Taper is bored in the spindle after assembly is complete. Large back gears of correct ratio deliver ample power for capacity loads. By boring the table arm, after assembly, with the same spindle furnished on the machine, table alignment is assured.

Sibley Catalogue No. 65 further describes the complete machine and may be had on request to the company men-

tioning this magazine.

### THREADING SPRING HANGER

Threading of new type of automotive spring hanger, is now being formed in only eight seconds per hanger, floor to

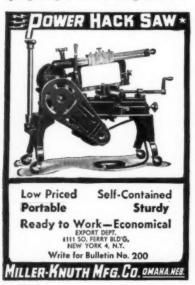
floor time, it is claimed.

To thread the hangers, a Detroit Tap & Tool Co. light duty tapping machine is used by Chapman Products Company, 5235 Grand River Avenue, Detroit 8, Mich. The operation consists of precision tapping to a depth of 1-45/64 inch with a standard 'Detroit' six flute tap ground with a four thread chamfer. The tap is mounted in a floating tapholder and the work is placed on a two pin locating fixture without clamping. Clamping is made unnecessary by use of the lead screw type machine. This type of machine eliminates tendency for the tap to bind on the return stroke. Tapping cycle is semi-automatic (tap, return, stop) to assure positive feeding at the high spindle speed of 400 rpm. The Chapman Co. says that tap life of over 5000 pieces between grinds is obtained even at the close tolerances maintained.

### GUARANTEED LIVE CENTER

Royal Products announces introduction of the Regal Live Center, a tool which they claim affords economical, precision production. Sizes range from 1 to 5 Morse Taper. Every Regal Live Center is guaranteed against defects of material and workmanship.

The point is hardened and ground.



# MACHINE TOOLS A combination of precision workmanship and advanced design contribute to the quality of output and quantity of work pleces produced on Roto-Matics. Production for exceeds that of standardized equipment used in the metal working industries today, because practically all operations are con-



No. 1-A MILLER

Catalogue 8-90 illustrating and describing various types of drilling, milling, reaming and boring machines is available on request.

DAVIS & THOMPSON CO.
MERS. OF MACHINE TOOLS & MICROMETERS
MILWAUKEE, WISCONSIN

### Save Space and Lifting

Yohe Racks take less floor space -hold more stock and require less lifting. Four arm rack, 51" high stacks, 10,000 lbs. Five arm rack 57" high holds 12,000 lbs. flat or round stock—at safe lifting heights. Use against wall or backto-back in center of room.

Let us send details and prices.

WM. S. YOHE SUPPLY CO. 503 Mahoning Rd., N.E. Canton, Ohio

Points are interchangeable, and all parts replaceable. Heavy duty, precision com-oination bearings absorb both radial and thrust loads. Lubricated with grease thru the opening formed by removing the shank. Positively sealed against all for-eign matter and cutting oils.

Royal claims they turn at a higher speed, make deeper cuts, and eliminate burnt-out and scored center holes. Ob-

tainable through distributors.

### AUTOMATIC SPOT WELDER

A moderately priced 7½ KVA Midget Automatic bench type air operated spot welder is now in production at the Uni-versal Welder Corp., 772 Carnegie Ave., Cleveland, Ohio.

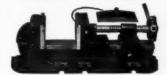
Four steps of adjustable weld heat control deliver a secondary maximum of 12,500 amperes so that it may successfully weld two thicknesses of 16 gauge clean

sheet steel.

Operating equipment includes an improved pressure switch, four way sole-noid air valve, a long life heavy duty butt contact type inbuilt welding contactor, an air flow regulating valve for adjustment of point impact speed and a foot switch and watercooled electrode holders for No. 1 Morse taper welding tips.

Standard units have a throat depth of 9 inches. Up to 16 inches can be obtained

### GEM VISES



J. E. MARTIN MACHINE WORKS SPRINGFIELD, OHIO

by factory modification of the upper cylinder press head mounting. The lower arm is adjustable up and down for a wide range of work.

### CENTERING THROAT CHASERS

The Landis Machine Co., Waynesboro, Pa., announces a centering throat chaser for work that may have thread concentric with the outside diameter. It is especially adapted to the threading of valve stems and other long length threads of coarse pitches.

In addition to holding concentricity between the thread and outside diameter of the work, the centering throat chaser, according to the manufacturer, eliminates an out of round condition that often exists when long work pieces are threaded. The centering throat takes a bearing as soon as the chaser contacts the work and assures accurate and well formed threads from the start.

### RELEASING TAP HOLDER

The Burg Tool Mfg., Co., 6709 South San Pedro St., Los Angeles 3, Cal., an-nounces a new Tool-Flex releasing tap holder. It is claimed that the flexibility of Tool-Flex compensates for parallel and angular misalignment, eliminates bind-ing which causes tap breakage and assures accurate tapping.

### PLEASE LET US HELP YOU IN TOOLING UP

WE DESIGN AND MAKE TOOLS, DIES, FIXTURES, SPECIAL MACHINERY ESTIMATES SUBMITTED PROMPTLY FROM YOUR BLUE PRINTS

WHEN PROMISED SO TO 90 TOS CAPACITY OF SMALL STAMPINGS DELIVERY

ALL NEW EQUIPMENT - 1000 HOURS PER WEEK . . . YOUR VISITS ARE WELCOMED.

PH. JEFFERSON 1956

1686 E. HUDSON ST. COLUMBUS 3, OHIO

PHILP DIE TOOL AND MACHINE CO.

### MELCO CENTER POINT LUBRICANTS

MELCO CENTER POINT LUBRICANTS are manufactured in both oil and grease form and are engineered prod-ucts high in E. P. properties and de-signed specifically for use on: Lathe and milling machine centers.

Grinding machine centers. Steady rests and heavy journals. Tapping, Broaching and Extruding.

Any application where extreme pressure or frictional heat prevails.

MELCO CENTER POINT LUBRICANTS are more economical than conventional lubricants and will prove a definite aid to production because:

Only one application is necessary. No time is lost in being obliged to

re-lubricate.
They prevent galling and burning of centers. Their high lubricity reduces power

consumption.

Lathe centers may be drawn up snug against the work, allowing finer tolerances and eliminating chatter marks.

Work expansion will not affect their "film'

They will permit higher speeds and heavier cuts. They do not emulsify with cutting oils or liquids.

They are non-toxic.

MELCO CENTER POINT OIL, because of its ability to reduce frictional heat, and its high load-bearing, wear-resisting properties, is an excellent additive for cutting, broaching, tapping, or drawing oils. It may also be added to ordinary gear oils to improve their lubricating qualities.

Send for Free Samples

### PRICES ON MELCO CENTER POINT OIL & GREASE

One Dozen 1"x6" Tubes. \$2.15 per Doz. Three Doz. 1"x6" Tubes. 2.00 per Doz. l quart can..... . . . . . . 1.25 gallon can, per gallon...... 4.00 gallon can, per gallon..... 3.75 15 gallon drum, per gallon..... 3.50 All Prices are F.O.B. Chicago, Ill.

### METAL LUBRICANTS CO.

Lubrication Engineers 3211 S. Wood St., Chicago 8, III. Phone Lafayette 9188

C. B. TEETER, National Distributor

### NEW 48-PAGE K & T CATALOG

A new 48-page general catalog in three colors has just been released by the Kearney & Trecker Corporation, Milwau-

kee 14. Wisc.

The catalog devotes six well illustrated pages to a short history of the company and its products, and the balance to a concise presentation of its entire line of milling machines, boring and milling machines and their accessories and allied products. Specifications of all machines, including both English and metric descriptions, are presented in fine-line drawings and two color tables. All types of machines are illustrated.

### PNEUMATIC IMPACT WRENCH

A new THOR pneumatic impact wrench, for driving and removing nuts, bolts and cap screws up to 3/8" thread size, is announced by Independent Pneumatic Tool Company, 600 West Jackson Blvd., Chicago 6.



Rotatively striking impact jaws, set at a wide radius from the spindle center to reduce stress, and a short, rigid spindle shank that delivers the blow close to the work are the principles claimed in the new THOR impact mechanism. Elimination of fastenings in the mechanism and compact, streamlined design of housings reduces weight to 3\(^4\) pounds and length of the tool to 5\(^6\)" for one-hand operation with greatly reduced torque reaction.

For complete specifications and information on the THOR %" wrench now available write for Circular No. 565.

### NOW CHESTER HOIST CO.

Chester Manufacturing Co., Lisbon, Ohio, manufacturers of Chain Hoists,

Trolleys, etc. which has been operated for the past five years as a partnership, has found it necessary, in order to take adequate care of greatly increased business, to incorporate as Chester Hoist Co., effective April 8, 1946.

The officials are,—President, Hal F. Wright (the founder of the business); Vice-President, Mary T. Wright; and Secretary and Treasurer, Harry E. Hill.

Just recently they moved into their large new building, especially designed and built for the modern manufacture of Chain Hoists, Trolleys and allied products.

R. N. Landreth, assistant to the vice-president, General Machinery Division, of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., has been named to direct the ac-tivities of the company's Washington, D. C., district office, according to an announcement by J. L. Singleton, manager of district offices for Allis-Chalmers.

### MULTI-TURN SPLIT COIL

Induction hardening of localized surfaces of such parts as crankshafts, camshafts, and similar components has been simplified by the patented Thermonic Multi-turn Split Coil developed by the Induction Heating Corporation. Where the design of the part to be hardened prevents it from being placed within the con-ventional type of induction heating coil, as is the case with a crankshaft, a splittype coil must be used. Where diameters are relatively small, say one inch or less, it is necessary to use coils of more than one turn in order to provide sufficient energy transfer to produce the results inherent to the induction-heating process.

The new Thermonic Multi-turn Split Coil consists of two or more turns, made up of machined copper plates, which are split and hinged in such a manner as to allow the coil to be opened, the work inserted in place, and the coil closed and clamped, automatically making contact between the segmental sections to provide a continuous path for current flow. The segments of the coil are held in relationship to each other by an insulating retainer ring which runs around the out-side of the coil proper and forms a closed passage between the coil turns.

When hardening operations are to be performed by use of the Thermonic Mul-ti-turn Split Coil, this chamber can be utilized to carry the quenching medium to the heated metal without removing the work from the coil. Thus, full advantage of the surface effect of high-frequency induction heating can be obtained. And since both the coil segments



98 (Without Fixtures) F.O.B. Chicago, Motor Extra

Rouse Fixture Set-Ups that Speed Production.





driven unit that has many uses in finishing operations for light cuts on aluminum, brass, steel and other metals ... also, rounding and burring steel and cast iron. Inexperienced operators quickly learn to use it with speed and precision.

It's a high-speed, motor-

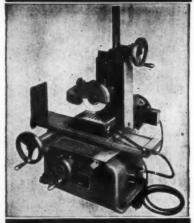
The Rouse Hand Miller, with Rouse Fixture Set-Ups, provides fast, accurate, low-cost milling for a big variety of small parts used in electrical work, instru-

ments, aviation, communications and similar work.

Available for immediate shipment. Write for illustrated circular and full details.

B. ROUSE COMPANY AND 2216 N. Wayne Ave. Chicago 14, III.

# SANFORD



### High-Speed BENCH SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed "For the job that fits in your palm."

WRITE FOR BULLETIN

SANFORD MFG. CO. 1020-28 Commerce Ave.

Union, N. J.

and the supporting leads are independ-ently water-cooled, the coil may be used without internal quenching, thus per-mitting continuous operation for all applications.

Power concentrations as high as 20 kilowatts per square inch on ½ inch diameter shafts are made possible by use of the Thermonic Multi-turn Split Coil, resulting in hardened cases of 0.020-inch thicknesses when used with Thermonic Induction-Heating Equipment having an output frequency of 375,000 cycles the manufacturer further states.

### FOUR TO ILG SALES STAFF

Additions to the sales engineering staff in four branch offices of the Ilg Electric Ventilating Co. have been announced by P. D. Briggs, Vice-President and General Sales Manager.

G. K. Wood has been appointed manager of the ILG branch in Columbus, Ohio. He spent the war years as a production executive of the Cleveland Graphite Bronze Co.

A. B. Davis, has been assigned to the ILG office in Charleston, W. Va. Carl E. Brock, Jr., former Lt. Comdr. in the U. S. Navy, has joined the Pittsburgh branch. During the War, he served as a naval engineer, supervising the repair, maintenance, and conversion of various types of naval vessels. Frank Taylor, has been assigned to the

New Orleans branch. Until his affiliation with ILG he was structural and experimental field engineer with United Aircraft Corp.

### REPRESENTS ELGIN TOOL WORKS

The Elgin Tool Works, Inc. of Chicago Illinois has announced the appointment of the George Scherr Company, Inc., 200 Lafayette Street, New York 12, N.Y. as exclusive metropolitan representatives for the New York territory on their line of precision bench lathes, screw machines and vertical and horizontal bench milling machines.

The latest bench models in which are incorporated the new all-speed variable speed drive are now on display under actual operating conditions. This new. smooth operating transmission eliminates changing of gears and belts. Thus any speed from 40 to 4000 rpm is quickly available without stopping the spindle. It is claimed that with this new variable speed control from 20 to 50% more production may be obtained since the operator has instantly available the proper speed required depending upon diameter of material and finish required.

The new model also has a knee hole for women operators which enables them to be seated conveniently and comfortably while operating the machine. The new Elgin Lathe as well as other machines are now being shown in the permanent exhibition rooms maintained by the George Scherr Company at 200 Lafayette Street corner of Broome, New York, N. Y.

### BULLETIN ON GRINDING MACHINES

The Heald Herald, May 1946, an interesting and informative bulletin published by the Heald Machine Co., Worcester, Mass., contains discussions of the two gaging principles in current use on the internal grinding machines which they manufacture. There are excellent illustrations of various models in the Heald line, and of some of the operations possible with the Heald Machines. The Heald No. 72 A5 plain universal which was designed to handle internal, external and surface grinding is explained and its components clearly illustrated.

The bulletin also contains descriptions of two of the specific jobs accomplished

by Heald machines.

### NEW BLACK AND WHITE PRINTER-DEVELOPER

Designed to provide simple, economical and efficient printing and developing facilities for black and white prints in medium quantities, a new BW printing and developing machine, known as the Model 41, has been announced by the Charles Bruning Co., 4754 Montrose Ave., Chicago 41, Ill. This model combines individual printing and developing units in a modern cabinet.

The Model 41 Printer has a printing speed range up to 6 feet per minute, depending on the transparency of the original, printing either roll stock or cut sheets, with a printing width of 46 inches. An entirely new method (patent applied for) of cooling pulls air into and through the cylinder and contact bands, resulting in minimum machine temperature.

Printing speed is controlled by a single knob, easily-read dial, located within convenient reach of the operator. Suction through the bands simplifies feeding of tracings and sensitized paper and the tangential method of feeding assures safety to the tracings and eliminates pinching or catching. Tracings and prints are removed without scraping, thus insuring long cylinder life. A front pedal located at floor level and at the center of machine, instantly releases band ten-

Whether You're driving nails and spikes for boxing and crating —



OR cutting doorways and windows through masonry walls —



## SYNTRON ELECTRIC HAMMERS

Will Save You MONEY, TIME and LABOR Write for Catalog No. 464 SYNTRON CO. 300 LEXINGTON HOMER CITY, PA.



SIMPLY INSERT OPTI-SETTER in drill jig, align cross lines to work layout, clamp drill jig, remove OPTI-SETTER, and drill!

**OPTI-SETTER** Eliminates centering errors when drilling to layouts.

Retains accuracy of original layout, whether machine drilled or drilled by hand.

A handy, low-cost tool with dozens of applications in every shop on drilling, measuring and inspection problems!

FREE FOLDER

describes Opti-Setter and uses. Write for your copy!

### THE BENTON CO.

LOS ANGELES 36, CALIF.

MANUFACTURERS OF OPTI-TOOLS

sion so that mis-feeding of roll stock can readily be corrected.

In the developing unit, speed in excess of maximum printer speed assures an uninterrupted flow of prints. Prints are delivered at front of the machine, within easy reach of the operator. A new type ironing results in flat, dry prints.

Speed, contact and development controls are quickly removable for cleaning and all parts in contact with the developer are of stainless steel or are non-metallic.

### DRILL UNIT

Mr. Arthur Boles, Tool Room Foreman of the McLaren Screw Products Co., says "It has been a privilege to use a Model K Govro-Nelson Drill Unit—We doubled our production on one particular job from one hundred pieces per hour to two hundred, each piece containing six holes. We have drilled as high as twelve hundred holes 201 inches diameter, 1/4 inch deep in one hour.

The Govro-Nelson Unit about which Mr. Boles is so enthusiastic is a centrifugal-feed unit designed for single or multiple operation. It is completely automatic with electrical controls and may be operated simultaneously, in sequence, or in conjunction with, other equipment from remote controls.

The manufacturer states that it is suitable for drilling, reaming, counter-sinking, counterboring, spot-facing, hollow-milling. The Govro-Nelson Drill Unit, Model K, has a spindle-speed of 3450 rpm (full load), and the range of operation is controlled by the size of tool that can be operated in a given material at this spindle-speed.

### DIAL BORE GAGE

With the announcement of its No. 0 Dial Bore Gage, Standard Gage Company, Poughkeepsie, N. Y., is extending the



range of this type of instrument down to 3/4". Now, seven sizes cover the overall range of 12% inches down to 3/4 inch.

The overall range of the No. 0 Dial Bore Gage as well as that of the other sizes is achieved by a series of diameter extensions which screw into the head opposite the actuating plunger. The gage is set by either a master ring or gage blocks.

The No. 0 Dial Bore Gage is furnished with an indicator graduated in either 0.001" or .002 mm. Although the indicator is of small size, the dial diameter being scarcely over an inch, it is claimed by the manufacturer to be accurate to within .00002". Diamond points can be supplied and are recommended when the gage is to be used on long run inspection.

### SURFACE PYROMETER

The new Pyro surface pyrometer made by the Pyrometer Instrument Co., of New York, is completely self-contained, portable, compact, and quick acting. Constructed in a shock, moisture and dust-proofed shielded steel housing it is immune to external magnetic influence and the large 4¾" diameter indicator with a 4" direct reading scale offers the greatest ease yet in reading temperatures quickly and accurately. An internal automatic cold end junction compensator is standard equipment with this instrument thus



further insuring highest precision accuracy. A choice of eight different thermocouples and two types of extension arms, all instantly interchangeable without adjustment or re-calibration, together with a selection of five different temperature ranges from 0-300°F to 0-1200°F makes this instrument ideally suited for any metallic or non-metallic surface temperature problem. The interchangeable thermocouples also have been designed to eliminate temperature gradient errors and all thermocouple wires have been carefully selected and checked to ±2 degrees Fahrenheit accuracy.

### FLEXIBLE SHAFT GRINDER

The Spring Specialty Co., Maywood, Illinois, announces a new, 18,000 rpm directly connected Leigh Flexible Shaft



# How One Manufacturer Profits by BEAR DY-NAMIC BALANCING

Reports the Dynamic Air Engineering Co. of Los Angeles: "Bear eliminates the "Wobblies" of un-balance in high speed axial flow propellers faster than 20 per hour to a 3 mil displacement tolerance." Here, as always, the Bear machine is so small in size, and so quick, that the operation fits readily into production,

Any shop hand can learn Bear-Balancing in less than a day. Every Bear machine is widely adaptable within its range. Each balances bodies to the recognized standards. All are very reasonably priced. Write for new literature... chase the "Wobblies," of dy-namic and static un-balance... improve both product and sales! BEAR MFG. CO., Industrial Div., Dept. MTBB, Rock Island, Ill,



BEAR

COMBINATION

STATIC AND DY-NAMIC BALANCING MACHINES

MORE POWER GREATER RIGIDITY INCREASED CAPACITY

in the New Model M-30 Diamond Miller

### uick Specifications!

| Table    | Long.  | Trans. | Vert.  |
|----------|--------|--------|--------|
| Size     | Travel | Travel | Travel |
| 7" × 30" | 18"    | 6"     | 10"    |

### FEATURES YOU'LL LIKE.

Increased table area with 18" travel accommodates bigger jobs. • Widely-spaced, hand-scraped dovetails and increased dimensions throughout provide exceptional rigidity. • 11/2 horsepower to spindle supplies power for heaviest cuts in all metals without chattering or stalling. 

Built-in gusher pump coolant system. 

Automatic table feed or rack and pinion table feed for high production.



Fully enclosed variable speed drive permits selection of any spindle speed from 75 to 1,200 r.p.m. Spindle noses are hardened and around with #9 B & S Taper, mounted in free-rolling Timken Taper Roller Bearings, adjustable for takeup.

Undoubtedly, the finest DIAMOND mill yet built! Ask today for free literature and quotations!

amond

ACHINE TOOL CO. DIAMOND Dept. B. 3429 E. Olympic Blvd.,

Los Angeles 23, Calif.

Grinder. A special type of ball bearing spindle has an integral, key operated 1/4 collet and can also be provided with auxconet and can also be provided with auxiliary insert reducing collets which accommodate \%", 3/32" and 3/16" arbors. The motor is a \% hp., ac. dc. type, provided with an end ring for suspension and rubber footed base for bench use. A variable speed rheostat or line switch can be supplied. Many special arbors, mounted wheels, rotary files, rubber drums, polishing chucks, etc., are available as accessories.

### FLEXIBLE SHAFT TOOL

A portable flexible shaft utility tool which they state is capable of getting into small corners and tight places, is now in production as announced by its manufacturer, The Dumore Co., Racine, Wis.



It weighs 8 pounds, and the 1/15 hp motor may be hung on any convenient hook, connected to an outlet and it's ready to operate.

This tool is equipped with a No. 0 bal-anced Jacobs chuck to handle all drills, grinding wheels, buffers, and countersink bits with shanks of 1/8" diameters or less.



Shaft is 36½ inches long, and normal speed for the handpiece is 500 to 3000 rpm, at gear reduction end. If desired, power may be taken off the other end of the motor for direct drive speeds of from 3000 to 10,000 rpm. Speed is controlled by a foot rheostat.

# Simple to Operate ... but Speeds Up Production

Speed up wire stripping operations in your shop by putting a Perfection Wire Stripper into use immediately. The most unskilled operator can remove insulation from the ends of solid, stranded or multi-conductor cable and wire almost instantly if the job is being performed by a Perfection Wire Stripper. It's a machine that's ruggedly built and it will do wire stripping jobs better, quicker and save money by speeding up your production.



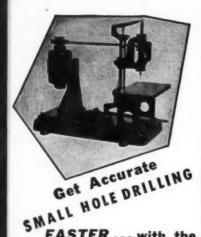
PERFECTION WIRE STRIPPER

### WEBER MACHINE CORP.

59 RUTTER ST.

ROCHESTER 6, N. Y.





FASTER ... with the L&D Micro-Drill Press

The Lord & Davis Micro-Drill Press gives you accurate small hole drilling . . . . 004" to 1/16" . . . faster and at lower cost because it has perfect operating control at high speeds.

Supersensitive Control. The floating spindle has supersensitive control. It operates with very slight pressure . . . feeding the drill at the correct rate. This positive, simple-to-use feature reduces drill breakage, cuts down work spoilage, and insures greater output at lower cost.

New Adjustable Bearings. The spindle floats in split-type bronze bearings, both top and bottom. These new bearings give proper running clearance, reduce vibration, assure true running spindle, and give you exceptional accuracy. They can be adjusted for wear to give longer life. Uses Pin or Jacobs Chucks. A Derbyshire Pin Chuck is standard equipment: Jacobs Chucks may be used with an adapter.

Drill accurate small holes faster, at lower cost, with L&D Micro-Drill Press. Send for folder today.

### MASSASOIT MACHINE COMPANY

224 Grove Street, Waltham 54, Mass. Sole Distributor for U.S.A. and Export Z. W. BROUILLARD & CO., Springfield 9, Mass.

FLEXIBLE SHAFT GRINDER
Mall Tool Co., 7742 South Chicago Ave.,
Chicago 19, Ill., recently announced the
production and availability of a new flex-

ible shaft grinder.

The new model, known as the Mallflex, has a 34 hp motor designed for operation on 110/220 volt single phase, a-c current. An extensive selection of spindles and attachments are available for grinding, disc sanding, polishing, wire brushing, drill-ing, drum and cone sanding and rasping for tire recapping.

The Mallflex equipped with casters is portable to any place in the shop. The pedestal type mounting provides for motor

tilting and swiveling.

NEW CHUCK-MATIC BULLETIN A twelve-page, bulletin SC-46 describ-

ing the new Acme-Gridley 12" single spindle Chuck-Matic has been announced by The National Acme Co., builders of

the chucking automatic.
The Chuck-Matic specializes in heavy duty, high production, metal-turning op-erations on castings, forgings, and tub-ing parts up to 12" diameter. Operations such as straight, internal or taper boring, form turning or form boring, external turning, forming, facing, and chamfering can be done on the Acme-Gridley Chuck-Matic.

You can obtain your copy of Chuck-Matic Bulletin SC-46 by writing on your company letterhead to The National Acme Co., 170 East 131st Street, Cleveland 8, Ohio.

SPINDLE SPEED REDUCER

The Cardinal No. 18 Slo-Drive manufactured by the Cardinal Machine Co., Glendale, Cal., was designed to increase the capacity and versatility of popular



makes of drill presses. Applied to any common make of 18" to 20" drill press it reduces the spindle speeds to a range which will accommodate drills and other tools up to one inch in diameter or larger.

Model 25 Hi-Duty Marking Machine

### MARK YOUR PARTS

Permanently

PART NUMBERS HEAT NUMBERS CATALOG NUMBERS SERIAL NUMBERS

PATENT NUMBERS

MANUFACTURER — INSTRUCTION DATA — INSPECTION Positive, Permanent marking on your products assist prospects to order. Makes it easier to buy—new, repeats and repairs. Gives you a definite record of pertinent data on each part produced.

The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It oper-ates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications.

We will be happy to make specific recommendations upon receipt of samples or prints of parts to be marked, showing approximate lettering, its location on the part, with required hourly production.



### MARKED PARTS ADVERTISE

IN THE RIGHT PLACE, AT THE RIGHT TIME

Send for complete catalog of our full line of marking Tools, Machinery and Equipment,

1802 W. Belle Plaine Ave.

Chicago 13, III.





# REDUCE HANDLING

of Tools, Parts and Materials



STACKBINS are individual hopper-fronted stacking bins, designed for storage, transportation and assembly of tools, parts and materials.

STACKRACKS are individual units which lock together to form racks of any size, shape or capacity. Stackbins slide like drawers in Stackracks.

Because Stackbins are portable containers—not fix-tures—tools, parts and materials can be carried to departments, from machine to machine, or held in stockrooms without being transferred from one con-tainer to another. Stored in Stackracks, any Stackbin is instantly accessible when its contents are needed without disturbing any other bin.

Manufactured and sold in Canada exclusively by Walter H. Wickware, Ottawa Write Stackbin Corp., 1085 Main St., Pawtucket, R. I.

"Stacked and



till Accessible"

# MANY USES-BIG SAVINGS WITH

# LOW TEMPERATURE MELTING

CERROMATRIX-250° F. For securing punch and die parts; anchoring machine parts; short run forming dies, etc.

CERROBEND-158° F. As a filler for bending thin-walled tubing-melts out in boiling water. Also used for automotive and aircraft assembly jigs, forming dies, etc.

CERROSAFE-165° F.-190° F. Used for proof-casting cavities in molds, forging dies, duplicate patterns, etc. CERROBASE - 255° F. Used in electroforming dies, molds, etc.

CERROTRU-281° F. Metal molds for wax patterns used to make precision castinas.

CERROLOW-117° F.-CERROLOW

-136° F. and CERROLOW---174° F.

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Metal Goods Corp.
19 E. Cameron
TORONTO 8. ONT.
The Canada Metal Co.
721 Eastern Ave.

CERRO DE PASCO COPPER CORPORATION 40 Wall St., New York 5, N. Y.

The actual speed reduction ration is nearly 3:1 below the normal range of such machines.

The No. 18 Slo-Drive is a compact standardized unit which will accommo-date any motor. All parts required for the installation are included in the unit. The unit is rated at 1 hp. capacity.

OPTICAL FLATS

Checking of gage blocks, anvils, sealing surfaces, and other precision articles for flatness, size, and parallelism is made simpler, accurate, and convenient by the use of square and rectangular optical flats, according to Optron Laboratory, 2656-B Salem Avenue, Box 25, Dayton 6, Ohio, manufacturer of these new flats.

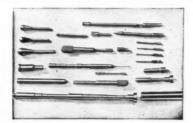


In addition, Optron flats are claimed to be easier to handle, for example, a 10" by 2%" flat can be used in place of a round flat 10" in diameter, weighs onefourth as much, and can be safely handled with one hand.

The straight edges of Optron flats provide reference lines for comparison of straightness of interference bands, often making it unnecessary to use rules or straightedges.

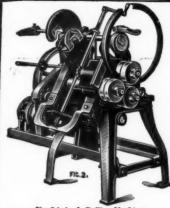
### LATHE CONVERTER

Oxford Engineering, Inc., of Oxford, Mich., offers a new Swiss Type Converter,



designed to make any lathe or similar tool into a quantity production machine for multi-diameter parts.

The converter can be used with any



No. 14 Angle Rolling Machine ROLLS ANGLES, TEE IRON, PIPE, FLATS, ROUNDS AND SQUARES

CAPACITY-2'x2'x1/4' ANGLE

Machine

THAT HAS FOUND ITS WAY INTO

40 States

used by Manufacturers of

SHIPS-PLANES-TANKS-AUTOMO-BILES-ENGINES-FURNACES-FARM MACHINES AND METAL PRODUCTS OF ALL KINDS

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U.S. ARMY—U.S. NAVY—N.Y.A. UNIVERSITIES

· · · There's a Reason!

EXCELSIOR TOOL & MACHINE CO. EAST ST. LOUIS, ILLINOIS

# ALMOND. Triple Jaw DRILL CHUCK

The Almond Three-Jaw Drill Chucks were pioneers in the field of drill chucks. Since 1872 they have played a necessary part in the logical procedure of machine developments.

Almond Chucks are furnished in nine sizes with capacities from 3/16 to 1". They are made for heavy and light duty types with taper or threaded arbor hole—to fit all machine tools and portable tools.



Write for complete details.

The Original

Manufacturers
of Drill Chucks

T. R. ALMOND CO.

ASHBURNHAM,

MASS., U.S.A.

# "Retool with Reltool!"

A Representative Line of FINE METAL CUTTING TOOLS



METAL SLITTING SAWS

The Reltool "Saw Line" Includes: High Speed Hollow Ground Siliting Saws, Screw Slotting Saws, Metal Slitting Saws with Side Chip Clearance, Metal Slitting Saws with Staggered Teeth and Side Chip Clearance and Formed Tooth Copper Slitting Saws.



#### COMBINATION CENTER DRILLS

Reliaol Combination Center Drills, both Regular and Bell Type, are made in both the Standard and the new SHOCKLESS Design, which reduces breakage to a minimum. Both types embody features which result in greater cutting efficiency and longer life.

### • TOOL BITS

Reliaol bits are made in three grades, UTILITY for general use and Premium Cobalt #8 and Premium Cobalt #8 and Premium Cobalt #8 and planer work on cast iron and alloy steels.



SPECIAL CUTTERS

Reltool Rotary or Slitting Shears and Discs and Circular Knives are made only on special order, to customer's specifications.

Order From Your Mill Supply Dealer

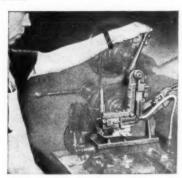
Reltool products are sold through Mill Supply Dealers in principal manufacturing centers. Write for name of nearest Reltool Dealer.



PIO WEST MICHIGAN STREET

MILWAUXEE 3, WISCONSIN

standard lathe, old or new. Tooling is by means of cams, which the user can make in his own plant. When not in use, the converter can be removed and stored, so that the lathe can be used for other work.



The Oxford Swiss Type Converter produces any part from a needle point to ½" OD and from ¾" length to six feet. The manufacturer states that ground stock is unnecessary, production being fast and accurate with any kind of cold-finished stock.

### VIBRATING ROD BOTTLE OILER

The Oil-Rite Corp., 3474 South 13th St., Milwaukee, Wis., announce a new Vibrating Rod Bottle Oiler which is automatic in operation. It is refilled without removal from its installation, and is furnished in unbreakable construction in a wide range of sizes.

It can be used on plain sleeve bearings, line shaft bearings, jack s hafts and spindles where light or medium bodied oils are satisfactory. It is suitable for dusty surroundings such as grinding machines to prevent dust, dirt and chips from getting into oil holes.

The oil is fed from an airtight reservoir through an oilport to a feed rod which slides freely in a closely fitted hole in the base and rides lightly on the journal. A slight vibration is caused by the directional drag of the rotating shaft on the feed rod, resulting in a pumping action.

Standard capacities have been selected of ½, 1, 2, 4, 8, 16, and 32 ounces, having ½, ¼, ½, or ½" pipe thread. Immediate delivery can be made on all sizes,

# NEW

# METAL MELTING FURNACE





Designed to save time and gas, this new Johnson melting furnace offers unusual efficiency and economy in melting such metals as lead, babbitt, tin, zinc, aluminum and type metal. Melts 600 pounds of lead in 29 minutes! Equipped with powerful Johnson direct jet burners, each having independent shut-off control. Permits use of 6 burners to develop pot temperature, 3 burners to hold temperature. No forced air blast required, Heavy insulation retains heat and minimizes operator fatigue. Low in original cost and upkeep. Write for details on the Johnson No. 616.

\$130.00 F.O.B. FACTORY

JOHNSON GAS APPLIANCE CO.

570 E. AVENUE N. W.,

CEDAR RAPIDS, IOWA

# PRECISION ROTARY TABLES



- 9"-\$ 97.00
- 12"— 160.00 15"— 185.00
- 18"— 220.00
- 18"— 350.00 Extra Heavy
- 21"— 500.00 Extra Heavy
- 25"— 590.00 Duty Extra Heavy Duty

OUR ROTARY TABLE WILL TAKE THE PLACE OF A COSTLY FIXTURE. IT IS USED FOR ALL KINDS OF WORK ON MILLING MACHINES, SHAPERS, DRILL PRESSES AND HORIZONTAL BORING MILLS.

WE CAN ALSO FURNISH DIVIDING ATTACHMENTS.

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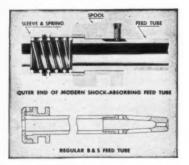
LAFAYETTE TOOL & SUPPLY CO.

128 LAFAYETTE STREET

NEW YORK 13, N. Y.

### SHOCK-ABSORBING FEED TUBES

Modern Collet and Machine Co., 401 Salliote St., Ecorse 18, Mich., announces a complete line of shock-absorbing feed tubes for Brown & Sharpe automatics



of all sizes and models which do not have a spring safety device incorporated in the feeding mechanism of the machine.

With these patented feed tubes, for-

feed latch is transmitted from the spool to the tube itself through a sleeve and helical compression spring. This spring permits normal feed without deflecting; but in case of interference with advance of the feed tube, the spring compresses and the spool slides forward freely on the tube, thus preventing breakage of the feeding mechanism or damage to the feed tube.

Where there is any interference with full advance of the stock itself the same releasing action takes place.

### TUBE TESTING PRESS

Beatty Machine & Mfg. Co., of Hammond, Ind., announce a new 25-ton Hydraulic Tube Testing Press, with specifications as listed below. This new unit is designed for testing tubes up to 3¼" i.d. and 48" long at 4800 lbs. sq. inch, hydrostatic internal pressure, but within limitations of its pressing and space capacities can be used for other diameters and lengths with the proper ram attachments.

Specifications: capacity 25 tons, stroke 8 inches, daylight 57 inches, depth of throat 6 inches, pressing speed 34" per min., return speed 68" per min., maximum length of tube tested 48 inches, test pressure 34" i.d.—4800 lbs. per sq. inch.

### HYDRO-BORER CAN DO A BETTER BORING JOB FOR YOU



Model C-4F with special fixture for Industrial use. In operation shown, Hydro-Borer is boring and counter boring two holes at  $14^\circ$  angle in 14 ST Aluminum. Size of bore .525  $^+$ .0005, length 3-1/4". Special or universal work-holding devices are readily designed and built for mounting on the Hydro-Borer. Many operations possible on these versatile, accurate machines. Eccentric boring head, calibrated, permits advance in bore up to .014 without resetting tool. Bores from 1/2" to 5" diameter by 5%" spindle travel. Other models for Automotive and Aircraft application.

Write us for engineering information on your boring problems.

### **HYDRO-BORER COMPANY**

MANUFACTURERS OF HYDRAULIC BORING MACHINES

1740 West 59th Street

Los Angeles 44, California

### TWO NEW GAGES

The F. H. Smith Mfg. Co., 3037-3047 Carroll Ave., Chicago 12, Ill., have recently announced two new gages designed to save time in screw machine and other shops where it is necessary to maintain tolerances with the least interruption. The Form Tool Setting Gage is designed

The Form Tool Setting Gage is designed primarily for use on Brown and Sharpe automatic screw machines for resetting the cutting edge of the Form Tool in precisely the same position from which they were removed before sharpening. The gage can also be used on other screw machines and lathes.



With this gage, both front and back slides can be set with equal speed and accuracy. The spindle may be running in either direction. The gages are made in three sizes for No. 0, No. 00, or No. 2 machines.

The Adjustable Length Gage is a new gage for quick checking of length dimensions. Frequently, production parts are made having more than one length dimension, that must be held within given limits.



The tolerances of .005" and .010" are ground on either end of the Adjustable Limit Ring as marked, while the fixed end and adjustable handle are ground flat.

The Adjustable Length Gage is available without the Adjustable Limit Ring or with one or more Limit Rings, giving several combinations of tolerances in multiples of .005" up to .020", increasing the adaptability of the Adjustable Length Gage.



### THE DRILL WITH A HUNDRED AND ONE SPEEDS

ALL SPEEDS INSTANTLY AVAILABLE WHILE MACHINE IS RUNNING

> TWO MODELS M125—3/8 CAP. M96—3/8 CAP.

SEND FOR CIRCULARS

THE TAYLOR & FENN CO. HARTFORD, CONN.

### SEE BETTER - WORK BETTER



CARL ZEISS INC. HEADBAND MAGNIFIER 21/4x

Use of both eyes reveals true depth of details. Magnifi-cation of 21/4x. Free working distance,

about 8", permitting unhindered use of hands. By just lifting your head, your eyes are free for any other activity. Eyeglasses may be worn while using, Highest optical quality. Eyeshade of Tenite—practically unbreakable.

Also Aplanatic **Folding Pocket** Magnifiers 6 and 9 power



Write for Leaflet

CARL ZEISS, INC.
Dept. H-55-6 485 5th Ave., New York 17, N. Y

### HEAVY-DUTY OIL-FUSE CUTOUTS

Announcement of an improved line of heavy-duty oil-fuse cutouts for over-current protection of power distribution systems in the 2400-, 4160-, 4800-, and 7200volt classes has been made by the Transformer Division of the General Electric Company.



The improved cutouts utilize the new universal fuse links which provide higher interrupting ratings, clearing fault cur-rents as high as 11,000 amperes, depending upon the rating. With this new design, 100-, 200-, and 300-amp rating cutouts with maximum short circuit interrupting rat-ings previously limited to 2500 volts are now extended to 5000 volts.

The cutouts provide a high degree of safety, for there are no exposed live parts, and no arc flames are ejected during cur-

rent interruption.

# LL THAT THE

TRU-CUT engineers have combined the sound fundamental of metallurgy with an advanced degree of skill in developing a new heat treating process of high speed steels, resulting in one of the greatest machine tool efficiency changes in tool history

Tool Bits Center Drills Key Seat Cutters . End Mills Milling Cutters . Form Tools

Write for Illustrated Catalog FEW TERRITORIES OPEN



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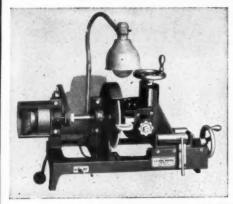
Detroit 4. Michigan



TRANSMISSION

For "A" section V-belts\_3.3\_1 speed range\_perfect belt alignment in all positions. Priced so low that no shop or machine need go withoutinfinite speed selec-\$16.50 (3 Types—8 sizes to choose from)

Standard Transmission Equipment Co. 3409 VERDUGO ROAD LOS-ANGELES, CALIF.



### SAVE

MONEY and ACCIDENTS

RESHARPEN
DULL
PIPE WRENCHES

Patent applied for GRINDER and Complete Accessories

### J. C. MOORE INDUSTRIES

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FREDONIA, PENNSYLVANIA

Specily For

COMPACT DESIGN

HIGH TORQUE

POSITIVE NEUTRAL

PRECISION BUILT

LONG WEAR LIFE

EASY ADJUSTMENT

ROCKFORD
PULLMORE

MULTIPLE-DISC
CLUTCHES

Send for This Handy Bulletin

It shows typical installations of ROCKFORD CLUTCHES and

POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.



plete specifications. Every production engineer will find help in this handy bulletin

\* High-ratio operating levers give PULLMORE chitches powerful engagement with slight axial pressure and short movement of the shifter speoly consequently operation is quick and easy. Dedutching is equally fast and positive. The shifter

spool has an extra deep slot which is hardened and ground. This prolongs the life of the clutch, reduces wear on the shifter fork and holds run-out to a minimum.

ROCKFORD CLUTCH DIVISION WARNER

1309 Eighteenth Avenue, Rockford, Illinois, U. S. A.

For heavy duty counterboring requiring rigidity, strength and perfect alignment, choose Gairing's type C. The handy kit shown below, gives you a wide range of cutter and pilot combinations.

### **COUNTERBORE SETS**

Write for Folder and Prices

THE GAIRING TOOL CO.

Roosevelt Park Box 478, Detroit 32, Mich.

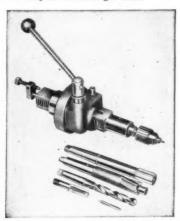


Sturdy box with hinged cover contains: holders C-12 and C-13; 20 cutters from  $\frac{9}{16}$ " to  $1\frac{3}{4}$ "; 28 pilots from  $\frac{9}{2}$ " to  $1\frac{1}{8}$ " and two  $\frac{7}{8}$ " countersinks, one 70° and one 82°.



### SENSITIVE TURRET ATTACHMENT

The Sudbury Grinding Co., of Sudbury, Mass., has announced a new sensitive turret attachment. The unit is mounted on one of the positions of the turret, and directly to the face of the turret in the case of smaller size turret lathes. There is an adapter in the larger sizes.



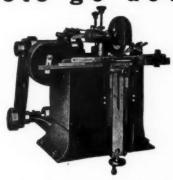
Some of the advantages claimed for it are as follows:

- Fingertip control which eliminates the drag and jerkiness of the heavy turret thus reducing the breakage of perishable tools,
- 2. Four point bearing of square ram reduces friction and gives maximum surface against torque.
- Round front end of ram has No. 4 Morse taper hole with drift and shear pin holes and is adaptable to all types of mounting.
- 4. Vernier depth control which insures accurate tolerances.

### TO STOP VIBRATION TRANSMISSION

Vibro-Levelers is the title of a new 8-page bulletin, No. BU50, issued by Bushings, Inc., Coolidge at 14 Mile Road, Royal Oak, Michigan, which gives information on how Vibro-Levelers are employed to stop transmission of vibration from not only small equipment, such as bench grinders, but also from heavy duty equipment, such as punch presses and drop hammers,

Saw blade replacement costs go down



Time and again the E.C. all purpose metal cutting hack, band and circular saw grinder has paid for itself within a year following its installation.

Not only do blades last langer but experience has shown that when a tooth is ground with the E.C. combination grinder, it will take a maximum bite with minimum destructive effect on tooth. Down time is cut to a minimum. Write for E.C. bulletin.

THE WARDWELL MANUFACTURING CO. 3165 Fulton Rd., Cleveland 9, Ohio



CIRCLE CUTTING
ATTACHMENT
Included as
STANDARD EQUIPMENT
with this Machine



WRITE FOR BULLETIN

SIMPLIFIES Maintenance
SPEEDS Production
SAVES Manpower

In wartime work, the Libert has amply proved its advantages by turning out top production—shearing flat or formed sheet metal, internal or external, plain or irregular shapes rapidly, accurately, cleanly!

Equally effective in maintenance work, Libert is cutting costs to rock bottom. Edges are smooth, need no finishing. Unskilled operators produce accurate work at once.

Sizes up to 60-in. throat, 10-gauge capacity.

LIBERT MACHINE COMPANY

Green Bay, Wisconsin

#### HARDENED AND GROUND DIE HEADS

The Landis Machine Company, Waynesboro, Pennsylvania, announces the availability of a new series of Lanco Hardened and Ground Die Heads, to supplement its present line. Heretofore, hardened and ground die heads of the LANCO type have been available up to the ½" size. The new series identified as the Type VV are available in the 1", 1½", 2" and 2½" sizes for use on hand operated threading machines. These heads are especially recommended for threading alloy steel

and for work which must be neid to extremely close tolerances.

The chaser holders of the Type VV Lanco Hardened and Ground Die Heads are clamped to chaser holder slides.

The chaser holder slides are gibbed to the head body to provide compensation for wear. These die heads have few operating parts, and the inclosed design prevents the entry of chips or dirt to assure maximum life. Zerk type fittings are provided to force heavy grease into the chaser slides and other operating parts. Size adjustments to the fraction of a thousandth can be obtained by means of a graduated adjusting ring at the rear of the head.

This Die Head employs the new Lanrac Chaser and chaser holder which was recently announced by the Landis Machine Company. The chaser and chaser holder combination employs a rack tooth arrangement to quickly locate the chaser in its approximate position after which an adjusting screw operating against the chaser clamp is employed to advance the chaser to the correct gage setting position.

### SEND US YOUR PRINTS FOR Quotations

### THREAD GRINDING

Also Internal, External and surface grinding.

BROACHING

SCREW MACHINE PRODUCTS MAGNETIC INSPECTION

• GEARS

SPUR

WORM



### PUNCH PRESS GUARD

The All American Safety Equipment Co., 11 So. La Salle St., Chicago 3, Ill., announces a new and successful type of punch press guard called the All American "Safe-Sweep".

Some features of this device are: the sweep can be set for entire length of bolster or to operate between tie rods; sweep arm can be set to operate close to die or to clear the front of the bolster; twinbuckle allows sweep arm to be set anywhere for start; pivot arm with slot can be set at proper angle to increase or reduce speed of Safe-Sweep across die; pivot in slot can be set for any radius. It attaches to ram head, making it proof against accident.



# DIAMOND ALME TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.

15 MAIDEN LANE, NEW YORK, N. Y.

MANHANDLING A HEAVYWEIGHT

Here is a Model 140 C-F Positioner, handling a large, unwieldy weld-ment with great safety to men and weldment. The weldment is clamped or tack welded to the Positioner table, and is under the positive control of the welder who can tilt the table to 135° from horizontal



C-F Power operated models with variable or constant speed table rotation have become important production tools in today's greater emphasis on welding for peace-time products. Drilled table is a convenient platen, permitting a wide choice of setting-up means, or is easily removed to provide for jigs or special fixtures. Write for Bulletin WP-22, which gives complete information on C-F Welding Positioners. Cullen-Friestedt Co., 1321 S. Kilbourn Ave., Chicago 23, III.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.



positioned welds mean better, more economical welds

BEWARE OF

IMITATIONS

MODEL No. 16 "SPECIAL"

CONSTRUCTED AS PER SPECIFICATIONS OF U. S.

NAVAL AIRCRAFT FACTORIES BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful ma-chine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D—10" Toble: Model E.L.—12" Toble. Model No. 14—14" table and heavy pedestals for all our machines.

161 GRAND ST., NEW YORK

Phone CAnal 6-5170



Registered U. S. Patent Office

# Long Recognized

for durability strength and service



The new improved Series A Robinson Punch Presses retain all the sturdy characteristics of their predecessors with added safety, speed, strength and ease of operation and maintenance. Available in five sizes.

Send for descriptive Bulletin No. 7.

New Albany Machine Mfg. Co. New Albany, Indiana, U.S.A.



### BUILDING MATERIALS OF WOOD AND ALUMINUM

ONE of many new products in Reynolds Metal Company, Reynalite, combines two sheets of aluminum bonded with a plastic adhesive, to a cellulosic core to form an attractive panel which possesses permanent rigidity, thwarts harmful elements, is easily worked and is adaptable to scores of major uses in building construction and related fields. It is impervious to moisture and to temperature changes.

Any design specification can be met with Reynalite because a wood veneer surface can be bonded to either of the metal surfaces or both.

"Tests have shown," said Mr. Reynolds, "that Reynalite has all the longlife qualities of seasoned lumber plus advantages which come only in a combination aluminum-core of this type."

Made available after months of study and experimentation by Reynolds research scientists, Reynalite has proven itself to be ideal for the construction of walls, ceilings, roofs, interior panels, doors, cabinets, partitions and other building parts; for railroad car panels, busses, trucks and trailers. It can be used, too, for stairways, refrigerator linings, overhead garage doors, electrical cabinets, junction boxes, medicine cabinets, elevator cabs, telephone booths, radiator covers, clothes hampers, tool chests, air ducts and heat ducts. This adaptability has been quickly seized by the furniture industry for use for table tops on occasional tables, coffee tables and end tables.

### **BURR KEYSEATERS**



Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

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JOHN T. BURR & SON 429 Kent Ave., Brooklyn, N. Y.

### CHECK EXTINGUISHERS CAREFULLY

Selection of fire extinguishers, unless obtained directly from the manufacturers or their authorized agents, requires special care at the present time because equipment now available from other sources as the result of government release of surplus extinguishers may no longer be fit for service.

Some of the models carry only "EAS," or temporary, approval by the Underwriters' and Factory Mutual Laboratories. These are the substandard devices manufactured as an emergency measure during the wartime shortage of critical materials. They are readily recognized by the letters "EAS," which stand for "Emergency Alternate Specifications" on the nameplate. Also such equipment bears a decalcomania rather than the standard metal nameplate.

Other equipment released as surplus, though standard at the time of its manufacture, may now be dangerous to use because of mishandling or improper maintenance since it left the factory. Dents, bulges, signs of corrosion, evidence of soldering or other repairs are indications that the equipment should not be used until it has been properly repaired and tested by the manufacturer.

### VISUAL AID AVAILABLE

The Haas Corporation of Mendon, Michigan has announced the production of the MAGNALITE, a visual aid for doctors, and first aid rooms.



MAGNALITE combines magnification with illumination thus in many cases the

# WHITNEY- JENSEN PRODUCTS



### No. 52 BENDER

Capacity

1/2" SOLID BARS 1/4"x2" FLATS
1/4"x2"x2" ANGLES

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INDUSTRIAL PRODUCTS SUPPLIERS 106 Water St., Dept. H, New York 5, N.Y. use of supplimentary lighting, lenzes, head reflectors, and face shields can be eliminated.

Flexibility and fingertip control are accomplished by means of a floating arm



which supports the lenz and lenz mounting. This counter balanced arm permits the lenz to be placed in any position where it remains fixed and self supporting. Adjustment in various positions can be made simply by moving the working head to the desired position. Because the unit is self supporting in all positions, both hands remain free to work on the patient.

Illumination comes from two built in flourescent tubes mounted in the plastic head. The light is soft and cool and causes the patient no discomfort. Since the tubes are behind the plastic shield, the doctor experiences no glare, all light being indirect from the examination side of the lenz. A broad field of vision is provided by the 5 inch optically ground magnifier. Two models, a floor and table mounting, in two different finishes, are available.

### FLUX FOR GAS-WELDING

Flo-Well No. 1, an improved free-flowing flux for gas welding is now being manufactured by A. K. Mauk, 7526 Hamilton Avenue, Pittsburgh 8, Pa.

Flo-Well is used to gas weld wrought, cast or high tensile aluminum and aluminum alloys, of any size or shape, wherever welding is possible. According to the manufacturer, Flo-Well will not solidify or deteriorate, and can be easily applied by inexperienced welders.

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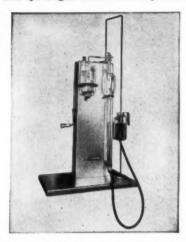
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AMERICAN MEASURING INSTRUMENTS CORP. 240 WEST 40th STREET NEW YORK 18, N. Y.

#### CARBON DETERMINATOR

A new Type Carbon Determinator has been announced by the Lindberg Engineering Co., of 2444 W. Hubbard St., Chicago 12, Ill.

The precisely graduated burette is mounted in front of a fluorescent light for more accurate reading, and to eliminate eye fatigue. Burette is water jacketed



and graduated for 1-gram and ¼-gram samples permitting full range use in analyzing the carbon in iron, steel, heat resisting steel, stainless steel and other materials.

The absorption chamber permits complete absorption in two passes—for many alloys, one pass is sufficient. The chamber combines the use of glass tubing and glass beads, achieving thorough gas dispersion.

A friction clamp holds the special leveling bulb positively at any point. A micrometer screw permits quick and easy zero adjustment.

Although designed for use with Lindberg Combustion Tube Furnaces, the new Lindberg Carbon Determinator is easily adapted for use with any high temperature combustion tube furnace.

#### POPPET TYPE CHECK VALVE

Use of lightweight metals, simplified design, and precision machining have enabled production of this radically new poppet type check valve, manufactured



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1"

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CUT YOUR PRODUCTION COSTS WITH ROLLER TURNERS.

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% to %'' capacity, %'' shank.......\$ 68.00  $\frac{3}{16}$  to 1'' capacity, 1'' shank........ 85.00  $\frac{3}{16}$  to 1'' capacity, flange type....... 85.00 % to 134'' capacity, flange type...... 110.00

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Precision Cutting Tools

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A strong lacing for all
types of belts. Put on with
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prevents fraying, 2-piece
hinged recker pins previded, 11 sizes. In boxes,
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and long lengths.

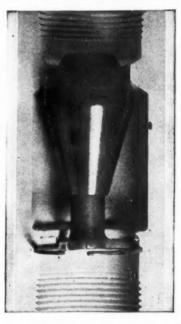
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#### ARMSTRONG-BRAY & CO.

"The Belt Lacing People" 5364 Northwest Highway, Chicago 30, U.S.A.



by Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N. Y. The unit is comprised of a valve housing, a hollow aluminum alloy poppet, an aluminum alloy poppet



guide, a valve spring, and a "Truearc" retaining ring. According to maker the valve completed a 50,000 cycle test, fully open to fully closed at 2000 psi without appreciable wear on either the poppet or the seat. The main features are its lightweight, construction, no moving parts excepting for the poppet, and positive opening and closing action.

#### MACHINING BULLETIN PUBLISHED

The Giddings & Lewis Machine Tool Co., of Fond du Lac, Wisconsin, have just published a bulletin entitled "Accessories and Attachments". This book illustrates and describes helpful time-saving, labor-saving and convenient G. & L. products. They claim that when such auxiliary equipment is used with Giddings & Lewis machines, it will aid materially in performing both standard and complex machining problems.

A USEFUL ADDITION

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

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GRINDERS & FIXTURES, Inc. 1249 W. 4th St. Cleveland 13, Ohio In the bulletin each attachment or accessory is properly named, and the machine on which it is used is indicated. In addition, the purpose, typical applications, structural features, specifications and descriptive copy are listed. Illustrations are profuse, and attachments or accessories are shown together with a photograph of the equipment in actual operation. Write for your copy.

#### SHEARCUTTING TOOL BIT

A new tool bit, the Shearcutter, which takes cuts two to three times its nominal size reduces production time and costs in the metal working industry according to the Fearless Tool Co., the manufacturer.



This new tool is said to cut metal with a knife-like action instead of chiseling it off. Digging in and chattering is prevented, they state, by the method in which the tool uses the chip removed in cutting. This action of the tool tends to keep the cutting edge sharp. The illustration shows a %" Shearcutter bit taking a 1\%" cut under power feed in cold rolled steel.

This cutting tool may be used on copper, brass, bronze, plastics, cast iron, steel and other ferrous and non-ferrous alloys without changing the original grind. For further information, write Fearless Tool Co., 1234 South Gramercy Place, Los Angeles 6, Calif.

MORE SPEED PROTECTION MORE SUPPORT NOTATION

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PADDOCK BALL-BEARING BAND SAW GUIDES should be your first thought in reducing manufacturing costs. Both old and new band-saws speed up, cut more materials, and turn out more work with installation of PADDOCK GUIDES. Broken blades, with loss of time and expensive blade replacements, are practically eliminated. PADDOCK GUIDES provide interchangeable wheels, running with the blade, as the best means of giving friction-free support. The price of these guides will be paid for many times over in blades saved and extra material turned out. Sold on 10 days Free Trial. Write for circular and prices at once.

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The Linley Milling and Jig Boring Machine boosts production in any plant by handling a wide variety of die, jig, fixture, pattern and model work . . . with speed and accuracy. Saves larger machines for their rated capacity.

It has 8 spindle speeds to 4250 r.p.m., velvet-smooth feed and direct micrometer setting. Changeover is easy and setup rapid. Fits in 2½ sq. ft. of space.

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### DON'T DISCARD **DULL TAPS**



Can be used on almost any type of tool and cutter grinder, surface grinder—even bench lathes. Tap is held in chuck—may be sharp-ened after center is destroyed. No collets. Complete. No extras. Write!

- · Built-in chamfer
- protractor. Simple shifter for 2-3-4 flute taps.
- Variable relief thru adjustment screw.
- · Easy · to · follow
- chamfer diagram on index plate.
   Capacity to 34" hand tap. ORDER NOW!

#### READING TAP GRINDER

Including Chuck, Complete, No Extras

### READING **BROACH KEYSEATER**

The Reading Bench Machine does not require bushings or quides. No other machine like it. Very fast capacity from 1/8 to 3/8 cutter. Low first cost - prompt delivery.



#### READING MACHINE CO.

READING (CINCINNATI) OHIO

#### BRUSHES NEED ATTENTION TOO

A thorough motor maintenance program does not neglect brushes. Proper method of cleaning and surfacing is to press the brush down on a strip of sand



paper placed between the brush and the commutator. The sand paper is then pulled in the direction of commutator rotation. Several passes should be suffi-cient, depending on the brush condition. A Westinghouse Photo.





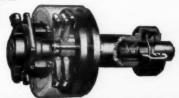
#### PUT A WATCH DOG ON YOUR OIL BARREL

You can eliminate many unnecessary trips by your men to the Oil Barrel for lubricant, if you use MULE-PULL CLUTCHES. Unlike other types they have an ANTI-FRICTION, ROLLER-LEVERAGE SYSTEM that requires no lubrication whatever. The Loose-Pulley Sleeves of these Clutches have ECONOMICAL RING-OILING LUBRICATION that is copious without waste and proportional to the speed. One application of oil lasts from 30 to 90 days and you are protected

at all times against scored Shofting and ground-out Loose-Pulley Sleeves, together with the costly shutdowns that accompany such failures.

CLUTCHES

SEND FOR BULLETIN 25-B



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The ATLAS



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The ATLAS Universal Joint, precision made completely from heat treated Alloy steels, has been serving industry for twenty years. The Vulcan Joint for use on Hoists, Power Take-offs and similar Equipment. There is no job too severe for the Vulcan. Featuring Alloy Steel drop-forged ends and oversize grease reservoir.

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#### SMALL THERMOSTAT

A small, compact thermostat for general application at 120-240 volts a-c that is designed to meet the requirements of Underwriters' Laboratories has recently been announced by Cam-Stat, Inc., 2037 South La Cienega, Los Angeles, Calif.

Only 1-9/16" in diameter and 1-7/32" in depth, the manufacturer claims that this type A Cam-Stat has many outstanding features formerly found only in thermostats of far larger proportions. These include a high current carrying capacity (1500 volt-amps) without the necessity of a condenser, low differentials (as low as 2 degrees F.), a wide selection of temperature ranges (from -50 to 350 degrees F.), resistance to vibration and switching arrangements of SPST break or make on temperature rise, SPDT and independent circuit double throw.

#### MODERN TYPE CAM RELIEVED FORM CUTTERS

Since the inception of form milling cutters, there has been a definite need for milled type, steep spiral, ground form milling cutters of various irregular shapes, having radii and angles tangent to each other. This demand is particularly insistent now that milling machines are equipped with larger motors and spindles, capable of running at higher speeds and taking heavier feeds.

Motor Tool Manufacturing Co., 7777 Cortland Ave., Detroit, Michigan, has completed development work and are producing cutters of this type in either arbor or shank type construction. These new cutters are designed and built to exactly fit the precise requirements of the user and, in the wide diversity of possible designs, cover approximately 80% of all form cutter applications. They incorporate many advantages over previous construction.

In operation, they cut with a continuous shearing action, teeth being in contact with the work at all times. The extreme helix angle can be carried up to thirty degrees, right or left hand. On long form cutters, staggered notches are incorporated in the design which serve as chipbreakers.

#### DO YOU NEED ONE?

Rutland Tool Service, 13006 Greeley Ave., Detroit 3, Michigan, now has for distribution a new decimal equivalent chart 9"x11". These charts may be had upon request on a company's letterhead.

#### W. B. PATTERSON DIES

William Blake Patterson, 89, known as "dean of Dayton businessmen," died recently at his home. He had been ill two weeks.

Until his retirement last year, Mr. Patterson was president and treasurer of the Patterson Tool and Supply company.

The tool store established in Dayton grew until it served nearly every industry here. During World War II it was engaged entirely in war work.

It was the Patterson company that sold the Wright brothers their first machinery when the Wright bicycle shop was established.

Some of that machinery bearing the Patterson name plate now is on exhibit at the Ford museum in Detroit. National Cash Register company also received its first equipment from the Pattersons.

#### MILLING MACHINE TOOL

The Leo G. Brown Engineering Co., 1127 Riverside Drive, Los Angeles 31, Calif., are now offering the industry a universal precision high-speed milling machine tool. They claim a number of achievements for their product as follows: Final grinding of collet chuck taper is performed after tool is assembled in its actual running bearings,—Hand feed micro quill graduations in .001 of an inch.—All angle graduations are in one degree markings,—Milling Tool vertical plane, high or low positions with alternating adjustments are engineered to save operating time and costs,—Silent spiral bevel gears give long wear,—Telescopic closefitted, hardened and ground spindles,—Finest pre-loaded ball bearings in every turning part. Send for their circular for complete details and description of other products.

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Have we made the necessary changes in plant layout (if any) to improve production efficiency, or have we just been dreaming about them?



SPEED UP production in multiple operations with push-out type Hall Collet Chuck. Full spindle capacity or over. Tremendous grip over or under stock size to .007-without adjustments...no bearings, friction, heat or loss of power. Instant release without stopping lathe.

Two-inch capacity, now only \$14\$ One-inch capacity, \$95 Round, square or hex collets, plain - serrated

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# Black Granite ANGLE PLATES NEW

Accuracy .00005"

(Patent Pending) Have all the improved features of

Black Granite Surface Plates

- - Initial Accuracy Lasting Accuracy
  - Warp and Shock Proof
  - Rust proof
  - Harder than tool steel
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  - Super smooth action

Write for bulletin giving full information.

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## LOOKING AHEAD

By George S. Benson

President—Harding College, Searcy, Arkansas

Financial reports make interesting reading to people who know even a little bit about what they mean. To some, they look drab because they are printed mainly in figures; many students never have learned to enjoy studying figures. Just the same, dull old numerals tell the truth in a romantic way to those who love cold facts of struggle and adventure.

Late in May it was my good fortune to have with me an annual report of one of America's largest corporations when I had to spend three hours on a day train. In the back of my mind as I rode along, was a lurking fear that I might reach home a day (maybe a week) late because of labor troubles, just then coiling to strike. My dread threw a bright light on the figures in hand.

#### Division of Wealth

The company about which I was reading plays an important part in the lives of more than a quarter of a million people: 100,000 employees and 150,000 stockholders. Two out of every five of these people drew wages while three out of five received dividends. The average share owner got less than \$500 a year. The average employee took home more than \$2,500 a year.

Daily newspapers for days had reported threats of strikes in the plants of the firm I was studying, also on the lines of the railroad I was riding, and in many other industries. Question: If all the employees of all the companies strike for what they want and get it, who will pay the difference? How will they pay it? These questions have answers and they're not secrets.

#### Enter Apple Conductor

The train stopped for a few minutes under the sheds of a big-town station and a railway newsboy came through with fresh afternoon papers. On page one, under Washington date-line, a wire story told how OPA would grant higher prices on automobiles. Nearby was another item about a 10 per cent boost in shoe prices. Then I remembered that bread and milk and meat all had gone up recently.

Whether you ride or walk or only eat, the price gains catch you. Wages are inside the cost of every manufactured thing, and the consumer pays. It is too obvious to deserve proof. Not long ago officialdom was sounding off freely about how wages in Detroit could be boosted without charging higher prices for automobiles but it didn't work out that way. Why?

#### Strikes Are Weapons

It is because strikes are not tools. The official theory was right: Wages can go up without boosting prices but production has to be increased if it happens, and strikes don't increase production. Sudden wage increases of 18 to 30 per cent have to come from somewhere, but where? A stockholder drawing \$500 a year can't offer much of a boon to a \$2.500 wage earner.

Strikes can't take something from the owners of a company that the owners don't get. That leaves nobody to pay the higher wages but Mr. Consumer whose family drives the car, wears the shoes and eats the food. A large majority of consumers are themselves workers. In the absence of increased production, a strike is a boomerang. It hits the consumer who is the worker himself.

"Today, individuals belong to the union, the corporation, the farm organization, the cooperative, the trade association, the professional society. Americans have transferred certain of their freedoms to these voluntary associations so that they can act and work more effectively in our modern mass production society."

—Eric Johnston

#### ILLUMINATED INSPECTION



"Lenox Detects Hidden Defects" while exploring the dark holes of industry — guns, hollow shafts — Refinery, well drill and other tubing, irregular dark spaces.

LENOX INSTRUMENT COMPANY

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#### A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in  $\frac{\pi}{12}$ " to 1" diameters. Send for price list.

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### THE "FORM-MASTER"

## ANGLE & RADIUS DRESSER

A sturdy, quality instrument designed by form-grinding specialists to dress both angles and radius at low cost. Two 1/3 ct. diamonds and instrument case included — \$150.00 complete.

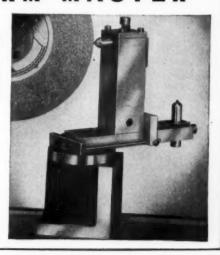
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Chatterless and dustproof.
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Simple to operate.
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## **Mechanization In Scotland Too**

#### From Scottish Engineering News

The development of an entirely new set up in the castings industry and the provision of new machinery, machine tools and new premises to cover the needs of the changing conditions have been urged this week in Falkirk, centre of the Scottish industry. About 50 per cent of the British output of certain classes of cast household goods are produced in this area and by firms with long established connections and of great reputation. The factor now affecting them all is that labor costs immensely more than it did prewar and is in great scarcity. Workers are showing the same reluctance to return to moulding as to spinning and certain other primary industries and are controlling volumes of output and future development by this disinclination to employment under former conditions.

The adoption of large scale mechanisation is seen as the solution and most of the casting industry firms are now studying this problem, making alterations and bringing premises into line with present requirements. The Forth Valley Industrial Development Board has recommended additional machinery and machine tools for use in all appropriate operations in the industry but has added the rider that these should not be installed in existing buildings.

#### Labour Needed Badly

The necessity is thus the reestablishment of the castings industry on a mechanised basis in new premises and this is proceeding to a certain extent, limited by the lack of building labour and the delay in getting new machine tools. Deliveries for certain types are now up to twelve months which might be the more serious were the premises available to house them. As it is the machine tools and new machinery may be available long before the buildings.

#### Disposal of War Plants

There is still a great deal of uncertainty evident as to the fate of many

war time plants in the West of Scotland, while others in the East, and notably Rosyth Dockyard, still remain without positive fate. One reason for this delay is the need to ensure that the maximum advantage is gained from the nature of the premises available. Hillington has been cited as a case in point. There has been continuous comment as to the fate of the Rolls-Royce Ltd plants at this estate and shopstewards have been particularly active in lobbying and advocating this or that line of policy. Much of this well meant activity is, probably, futile. The fate of these important works is being considered 'at the highest level' and any decision made will be made to ensure that the area gets the finest form of employment which will make the fullest use of the facilities available. This may not satisfy the shopstewards who have been making political capital out of the problem, nor will it have much effect in stilling the clamour. The point is that as yet there has been no decision as to the future of these plants and that great care is being exercised in the selection of an ultimate tenant industry, or industries.

#### Still In a Quandry

Efforts are being similarly made to reestablish in Greenock the pre-war Caird's yard. This yard, closed down under the redundancy scheme between the wars has been developed as a light engineering plant by the Ministry of Supply and the Air Ministry at a cost of about £100.000. Now that the shipbuilding industry is in difficulties for space, pressure is being applied to have the area derequisitioned. If it reverts to shipbuilding, the light engineering lay-out will be destroyed. If it remains a light engineering centre, ships cannot be built. That is, in essence, the problem now demonstrated at many of the Scottish engineering centres at this time. Labour is relatively available but premises and modern planned plants are scarce and in controversial supply.

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Have we investigated with our bankers if estimates indicate, in view of backlog of orders, whether or not our working capital will prove adequate?

Are we building up proper depreciation and obsolescence reserves?

Have we made intelligent estimates of the kinds and quantities of products we will be able to sell in the future?



#### DYKEM STEEL BLUE STOPS LOSSES making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

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#### ADD PRODUCTION FACILITIES

The War Assets Administration, Office of Real Property Disposal Price Review Board, has authorized the following sales and leases of governmentowned surplus property, subject to compliance with the Surplus Property Act and applicable regulations issued thereunder:

#### **Kropp Company Forgings**

The aircraft forging plant, leased and operated during the war by the Kropp Forge Co., at 5301 W. Roosevelt Road, Chicago, Ill., has been leased to the Kropp Co. for five years at a minimum rental of \$50,000 a year with additional return payable on a sales percentage basis. The lease agreement also carries an option to purchase at any time during the first four years of the proposed lease.

The Kropp Co. plans to convert the plant from the production of aircraft forging to general commercial forging at a cost of over \$500,000. The company anticipates that over 800 persons will be engaged during the change-over period with a maximum employment of 1,200 on completion of the conversion plans.

#### Ohio Steel Foundry Co.

The steel casting and foundry facility at Lima, O., operated during the war by the Ohio Steel Foundry Co., has been leased to that company for three years at a guaranteed minimum yearly rental of \$50,000. The new occupant plans to utilize the acquired installation in the production of rolls for use in steel mills. This plant contains many production items of no peace-time economy value which the tenant will maintain on a standby basis for the period of the lease. The company estimates that its occupancy of the plant will provide employment for 900 persons.

#### **Broden to Make Mills**

The Broden Construction Co. has purchased for \$112,940.49, the plant it leased and operated during the war at 22800 Lakeland Blvd., Euclid, O. The plant will be utilized in the production of vertical boring and turning mills.

#### WAR PLANTS SOLD

The purchase of five Chicago area war plants from the War Assets Administration by manufacturing concerns during the first half of June was announced today by F. A. McLauchlan, Chicago WAA Regional Director.

The Sundstrand Machine Co.'s added wartime facilities in Rockford have been purchased by the Isaacson Iron Works of Seattle for the manufacture of tractor equipment. The sale price was \$360,000. Original cost to the government of the property was \$564,475.

William T. Kirby, in the Chicago WAA regional office, stated that the Isaacson firm expects to employ from 400 to 600 persons in their Rockford plant.

The Chain Belt Co. has purchased the Milwaukee plant of which they were lessees during the war for \$1,422,000. Nash Kelvinator has taken over a Kenosha plant which they leased during the war, for automotive assembly, Kirby stated. The plant, which cost the government \$4,201,743 was purchased by Nash for \$1,237,000 and will employ an additional 800 persons.

In Chicago, A. Finkl & Sons are purchasing the plant they leased during the war period to produce forgings. Purchase price was \$147,349 as against an original cost to the government of \$278,363. The plant will employ 60 persons.

The Foote Bros. Gear & Machine Co.'s added wartime plant in Chicago is being purchased by the Electric Storage Battery Co. for \$1,000,000. Original cost to the government was \$1,456,-807. The plant will employ about 800 persons.

#### ASK YOURSELF:

Are we, as producers of primary goods, as fully aware as possible of plans of the users of our products? Could we have a conference with them on the subject?

Should we install a marketing research department or should we engage a research organization to assist us?



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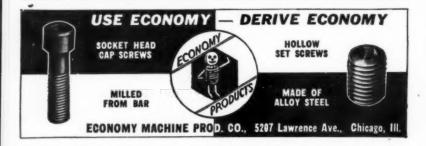


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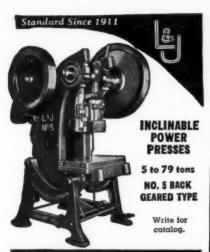
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Mail your orders today!

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## "OLIVER" SPINNING LATHE



Smoothly spins all metals including sheet steel. Headstock spindle has taper roller bearings with large thrust capacity. Ball bearing live tail center. Made in 12, 16, 20, 24, 30 inch diameter swing over bed; with plain bed or carriage. Write for complete information.

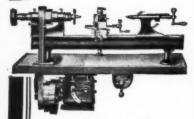
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### PRECISION **ENCH LATHES**



With Motor Drive Unit (9 Speeds)

Dependable for long service on exacting work which they handle with facility and speed. Records of 20 years continuous service are not unusual.

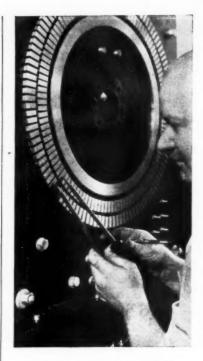
Write us your requirements. Now 4 good sizes, 1/4", 1/2", 3/4" and 1" collet capacity.

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SPECIFICATIONS-Navy bronze contact plate: Aluminu alloy case 4" x 8" x 10"; Weight 22 pounds; Recessed. heavy duty heat selector switch and pilot light; Handy cord storage compartment; Special current regulating transformer gives smooth etching action with the offset, coolgrip stylus.

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Bulletin

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Used by trainee or "old hand," Comtorplug gives automatic precision to fractions of .0001". Patented expanding internal comparator shows ACTUAL SIZE (not a passing reading), front or back taper, out-of-round, bell mouth, etc. Rugged, practical for machine operators and bench inspectors.

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5,000 New Steel Stacking Boxes



\$2.25 each, F.O.B. Chicago 24"x15"x7½—16 gauge. Drop handles both ends.

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Pictured: a 38-Spindle Heavy-Duty
Drill Head.

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MICHIGAN DRILL HEAD CO.



duction in the num-ber of taps broken, as against tapping methods used in the past. One such machine observed is equipped with a foot pedal air valve, so the operator can readily control the starting of the tap-

ping spindle, in com-bination with his loading of the workpieces. All he has to do is to load and unload the work, and depress the pedal. The actual cycle of the spindle is not a matter of concern to him, because both down stroke and return stroke are entirely controlled by air. The tap head action has been made very sensitive, and if the tap loads or dulls, the machine simply refuses to work. Ma-chines of this kind have often been arranged with dial-feed fixtures, which index automatically, under control of spe-cial automatic air valves, still further stepping up output on some kinds of work.

#### **TAPPING**

Whatever the particular kind of tapping being done, or whatever kind of tapping equipment or machine is being employed for the purpose, we must never lose sight of the proposition that good tapping is highly dependent on high-quality taps, and high-quality taps can only be made from a tool steel having the requisite properties. Manufacturers of tool steels can always recommend a proper steel for this purpose. Those who have a reputation for making quality taps are known to look into this matter very fully.
The different kinds of solid taps avail-

342

able would be a revelation to many who have been confined to one type of tapping work. One leading manufacturer of taps has pointed out that in some sizes, as for instance ½". 13 N. C., he makes 61 different kinds. Many of these look very much alike, and would not be known apart by the casual observer, but each one has its own particular qualities and field of usefulness. Small wonder that tapping specialists are able to "prescribe" a remedy for

many

the work.

tapping troubles, by the simple proposition of providing just the tool best suited for

Single-spindle tapping machines of

pneumatic - control type have been placed in use in a great many shops,

and have shown a

very remarkable re-

#### INTERNATIONAL TRAINING

More than five hundred concerns from almost every phase of American industry and business are participating in the program of training young nationals of other countries in American industrial "know how" administered by the International Training Administration, Inc., according to an article in recent issues of World's Business and Guia, the export business publications.

Originally instituted in 1941 as the Inter-American Trade Scholarship program under the good neighbor policy, this training program has expanded rapidly and has developed to worldwide scope under the direction of Elliott S. Hanson, president of the International Training Administration. By sharing this industrial "know how", participants in the program feel that the United States is not only creating good will for itself, but is also greatly increasing the demand for American products and equipment with which the trainees have become familiar in this country. In addition, upon their return home, the trainees are better qualified to do the servicing of the electrical, mechanical, agricultural and automotive equipment made in this country.

The training courses provided are not standardized, but tailor-made to suit the needs of the trainee and his sponsor. At present there are approximately 1400 trainees from overseas in the United States engaged in a wide variety of training—the manufacture and use of agricultural and road building machinery, machine tool and other industrial equipment, radio repair and manufacture, a u t o m o b i le construction and maintenance, p e t r o le u m production, aviation—to mention only a few.

#### SMALL PARTS LATHE ATTACHMENT

Dunn Engineering Company of 6341 Lyndon Avenue, Detroit 21, Michigan, announces the completion of all engineering and development work in connection with its "Dunamatic" Lathe Attachment, and are now producing this machine in quantity and it will be available to the trade through established distributors of machine tools thruout the United States.

The "Dunamatic" is designed for attachment to either the Atlas or Logan lathe, and its use with either one provides an entirely new means of producing small parts automatically, and with good accuracy, at very low cost.

This attachment employs the use of face cams to control the operation of rocker arms which, in turn, control the operation of form and/or cut-off tools attached to them. Either circular or flat form tools or a combination of both may be used, the selection of type depending upon size of the production run. The rocker arms operate on pivots instead of slides (which, of course, are flat surfaced) thus eliminating the necessity for constant adjustment. A means of adjustment is provided, however, when long usage might make simple adjustments necessary. Since all the pivot parts are precision ground and properly hardened, need for adjustment is seldom necessary.

The stock is cam fed thru a tube by feed fingers, into a collet, automatically, and a moving stock stop determines the length of the part to be formed and/or cut off. Closing of the collet, which is also an automatic operation, is timed to co-incide with the start of operation of the work tools.

Power for operation of the "Dunamatic" is taken from the standard lathe lead screw and transmitted, by means of a roller chain and steel sprockets, thru a steel worm and bronze worm gear, providing very efficient and at the same time, quiet operation.

#### ASK YOURSELF:

What plans have we made for marketing and distributing the quantity of our products which we estimate we can sell "after the war"?

To what extent should we include in these plans changes in selling methods which may be necessary as a result of changes in markets, products, buying habits etc?

How should we plan to establish enough dealers to give us proper distribution?

Should we consider new or different channels of distribution for our products? How many salesmen do we require and where shall they be located?



Available in 8 sizes -- capacity, 6 to 80 tons.

erry it on the Federals' has become a common expression in nearly every division of the metal-working industry. Thanks to remarkable versatility. Federal Dial Feed Presses now produce scores of special items which formerly required special machinery of limited utility — often increase production speed as much as 3 to 6 times! Exceptional accuracy and safety are equally important features, Write for catalog on the Federal line.

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#### LUBRICATION IDEAS

There are many aspects to lubrication. One of the most important is the kind of lubricant that should be chosen to do a certain type of duty. Consider bearings that are more or less continually subjected to heat, such as kiln car wheel bearings. Graphite has always been found a logical lubricant for use in the presence of much heat. In many cases, colloidal graphite is used, to solve high temperature lubrication problems. The carrier liquid for the graphite evaporates in time, leaving only the graphite, which becomes a part of the bearing surface.

High pressure lubrication systems, which use special grease guns, and incorporate button head, pin, push or dot type fittings, are quite well known, and much appreciated for many kinds of work. They are not, of course, universally applicable. In the case of various machines requiring a continual supply of oil to given slides or ways, modern design very often contemplates the use of a lubricating system that will continually deliver a small but measured amount. Lubricating systems built into machines eliminate all worry as to whether oil is being delivered where it is needed, in just the proper amount. One hydraulic grinder is in mind, on which the bearing sur-faces of the table ways have a continuous film of clean oil metered to them. Such lubricating systems are built by specialists, and made available to machine designers.

A very interest-

ing proposition has been noted with regard to lubrication on a certain metal-working shaper, which has a pressure-type oil system. A special piston-type device works in conjunction with it, in such manner that the machine cannot be operated unless the lubricating system is functioning properly. The piston mentioned is turned to a smaller diameter in its center length. When pressure is what it should be in the lubricating system, this piston is forced downward, against the resistance of a compression spring, allowing control lever to be moved into the starting position, before shaper ram can operate.



No. 16 5 TON INCLINABLE POWER PRESS

ACCURATE DURABLE

WEIGHT ...520 lbs.

CRANKSHAFT. dia. main brgs. ....156" at C.S. brgs. ...134"

RAM stand stke...!" maximum stke. ..2"
(to order extra ch'ge)

OVERHANG, center of slide to frame 31/2"

BED, area bolster plate ......12x7"
Size of opening
through back ....7"

MOTOR required, 1/2 HP 1200 RPM For Further Details Write

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In competitive days ahead tool and die makers will have to know every short-cut for doing each job best. And this 315page illustrated book gets right to the heart of your tooling-up and tool performance problems.



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Check the ways "Tool Steel Simplified" can really help you. Here are a few of the 18 fast-reading Chapters: The "Personality" of Tool Steel, Heat Treating Methods, Hardness and Toughness Testing, Relation of Design to Heat Treatment, Quenching, Trouble Shooting.

In designing, making or heat treating tools or dies, you will want a copy of "Tool Steel Simplified" . . . sold at the low price of only \$1.00 a copy. Every man who works with tool steel should have a copy. So order as many as you need, at only \$1.00 per copy. Send in the coupon today.

the chips produced, the more troublesome they are liable to be. with regard to getting into ma-chine parts. Take chips that come from threading machines, as a case in point. One leading builder of threading machines, it has been observed, has enclosed the lead screw inside of a steel tube, in order to protect it from such chips. The tube does the job adequately.

Have you ever observed operations in which trouble was experienced with circular metal cutting saws, because chips drove into the saw gullets, and clogged there? It is interesting to observe that at least one manufacturer of circular metalcutting saws has gotten away from this trouble completely by the simple expedient of so governing the tooth and gullet form in the blades, that the chip is caused to begin taking a curved form the instant it is lifted

from the stock. In other words, the particular form of gullets ground into these blades literally rolls the chips up, similar to a clock spring. Under the pressure of cutting, the spiral-wound chip is somewhat compressed, and as soon as it comes to the surface of the stock, it tends to leap free of the gullet, thus making the sawblade positively self-cleaning as the work proceeds.

Another interesting departure that has come into various metal-working shops is the use of an auxiliary device on a drill spindle, which serves to break the chips being cut by the drill.

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#### THE CARPENTER STEEL COMPANY

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Please send me postpaid your convenient handbook, "Tool Steel Simplified." I enclose \$1.00 (\$3.50 outside the U.S.A.) in full payment.

Firm Name [Firm name must be given]

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#### CHIP TROUBLES

Metal chips are a problem in various ways. Sometimes it is with reference to clearing chips from different kinds of metal-cutting tools properly. Other times, it is a proposition of protecting machine parts against cutting and wear, as a result of chips finding their way in between working surfaces. It is well to design machines, as far as consistent, so their most particular working parts will be located above the point of cutting. Then, chips will drop away from them, rather than into them. But this cannot always be done. Obviously, the smaller or finer

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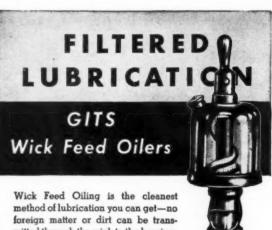
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Just a dozen Champion Expanding Mandrels will do the work of hundreds of solid mandrels and cost you only about one-fifth as much! Champions completely and accurately fill holes in the 1/2" to 61/2" range, with infinite variations . . . hold work of any length bore; maintain close tolerances; and release work easily. Made in two simple parts - a flexible round sleeve and a taper arbor-of top-quality, heat-treated steel, Champions efficiently handle all hard and soft metals, on all large and small jobs. You can depend on Champions.



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whick reed Olling is the cleanest method of lubrication you can get—no foreign matter or dirt can be transmitted through the wick to the bearing. It can be varied to supply just the right amount of not-too-heavy oil at any one of several locations on each bearing whether it be vertical or angular position; high, low or intermitted in speed. Gits Wick Feed Oilers are available in a wide range of styles, sizes and materials. Ask for complete information on this type of oiler.

## GITS BROS. MFG. CO.

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Exclusive for over 35 years

#### FINISHING CASTINGS

Preparation of any product for finishing always contemplates a thorough prior cleaning. In most instances, castings used in a product require cleaning from foundry sand, fins, etc., rather than from grease and coolant, though in some instances removal of coolant oils may be involved. An interesting proposition in regard to cleaning castings from molding sand, is the fact that sand is often used to do the job, by way of a sandblasting outfit. On the other hand, tumbling barrels are much used for this purpose. In some interesting instances, both actions are combined, for there are sandblasting

barrels in use for this purpose in different places. These barrels are of tilting tumbler type, and the sandblast is introduced through a pipe, entering the barrel cover. While the time required for cleaning depends on the nature of the work, ordinary small castings are thoroughly cleaned from molding sand in five or ten minutes.

Many of the gates and fins can be advantageously removed from castings with modern metal-cutting bandsaws of vertical type, but there are some fins and rough places that must be taken away by fil-ing. Rotary files are much favored for this purpose. It is to be remembered that a rotary file, work-ing on the surfaces of unmachined castings, must be run at a slower speed for good results, than where it is operating on a surface which has had the scale fully removed. Using a rotary file of highspeed steel, speed it to around 200 surface feet per minute, if possible, for working on cast iron scale. It can be run

at almost double this speed when work-

ing on scale-free surfaces.

Special varnishes have been provided by different manufacturers of finishing materials, to seal the pores in castings, and to protect them against corrosion. These varnishes are often baked after application. Since castings are often drilled, it is often important to find a method of keeping finishing materials out of drilled holes, as well as other recesses. One interesting method of doing this is to first cover the holes with special masking stickers. Such are applied without moistening, adhere to any smooth surface, and are easily peeled off afterward.

#### NEW DEARBORN MODEL " E" CHUCKING THE

#### INDEXING FIXTURES AND



Dearborn fixtures meet every demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting.

Model E is both a degree and a ratchet indexing fixture. It may be changed from one to the other in less than a minute. It will index any number of degrees or any will index any number of degrees or any fraction of a degree. Two adjustable stops

are provided so that two necessary.

Work is held by collets which take up to and including 1" round, 7%" hexagon and 34" square. Other shapes can be held with Work is held by special collets.

Let us send bulletin giving full information.

#### J. W. DEARBORN

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### DESMOND GRINDING WHEEL DRESSERS



Correct method of using Huntington Dresser.

You can increase your grinding production by dressing your wheels regularly with Desmond Dressers.

We manufacture the only complete line of dressers and will be glad to send any of them to you for trial or advise the type and size you should use.

Write today for a copy of our catalog "H" and name of your nearest dealer.





Pratt Grinding Gauges caliper external cylindrical jobs while work is in motion or at rest. Adapted to straight or tapered work. Tolerances of .0001" plus or minus easily maintained. Visible check on out of roundness, rough grinding and chatter. Cannot grind work undersize unknowingly. Easily installed on any grinder. Pratt Grinding Gauges increase production, eliminate scrap and assure accuracy. A modern precision tool, ruggedly built.

Send for Bulletin

# DIAMOND TOOL & GAUGE CO. 15920 WOODINGHAM • DETROIT 21, MICH.

#### TOOL BITS

It is undoubtedly true that the efficiency of any metal-working plant will not grade higher than the quality of tool bits used, and quality in a tool bit speaks of its proper maintenance, as well as of containing the proper stuff to stand up to the cut. It is a fact that while carbide bits have made great advances, and are the best thing to use in many places and under many circumstances, there is still a large working field for high speed steel bits. These are provided by various manufacturers of tool steels.

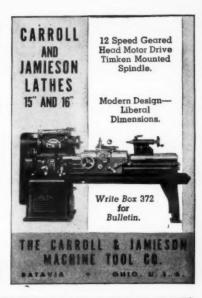
Due to the fact that high-precision pro-

grinders have been developed and put into use for grinding tungsten carbide and other very hard metals, to any given profile, cemented - carbide tipped, formed tools of all kinds can be produced, and are being provided for the trade, by form manufacturers tool equipped with such grinders. Forming operations with steel tools often leave much to be desired. for some parts of a tool edge forming inevitably wear faster than others. On any tool material having a relatively high rate of wear, this trouble is naturally accentuated. This, in itself, has been sufficient to sell many manufacturers on the use of cemented - carbide form tools.

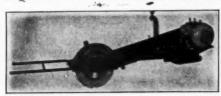
A very remarkable development recently observed in the field of tool bits, is one where so-called ejector-type tools are in use. Basically, a steel tool bit is provided with an opening, lengthwise, designed to receive, contain and mechanically hold a long, solid carbide insert. The effect is much the same as on

brazed tips, with the exception that any strain produced by brazing is eliminated, since the insert is held entirely by mechanical means. The front end of the steel bit is slit for a moderate distance, is also drilled transversely, and tapped in such manner that a hollow-head screw can be applied, to produce a clamping action on the carbide insert. Whenever it is necessary, with this provision, the screw can be loosened, and the carbide insert moved out a trifle, on the principle of an ejector lead pencil, for regrinding, and yet maintaining the original length of the complete tool bit.





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#### ROTARY FILING

Undoubtedly the flexible shaft type of rotary filing machine has been used far more extensively than any other type of equipment for powering rotary files, due to the fact that one can readily turn the revolving tool into any desired angle of approach to the work. However, in a few instances, where workpieces to be rotary filed are light, and easy to handle, so the workpiece itself can be readily manipulated, rotary files can be held in drill press spindles to advantage. One type of work has been observed, in fact, where the rotary file must be held in a rigid

mounting such as a drill spindle, in order to use it properly. This is a special rotary file, designed with a shape adapted for filing the clearbreak on ance punches and like while items. volving in the drill spindle, with the work flat on the drill press table. This is known as clearance file.

One style of rotary file furnished by a leading manufacturer is made with a ball - shaped cutting end, and is especially useful. Regardless of the angle from which it approaches the work, it will still cut a true concave These files, arc. made in a range of diameters from 1/8" to 1", are highly useful for blending in fillets on metal patterns, castings or forgings. Another interesting proposition is their use for burring holes. They automatically take even-pressure contact all around the edge of a drilled hole, and since the ball-shaped cutter is at the end of a

shank, holes can be easily reached that are located in relatively tight places,

Many who practice rotary filing more or less extensively may not know that solid carbide burrs of small size are now in use. These have their cutting ends ground from solid ½" tungsten carbide blanks. One company makes eight standard shapes of these available. These cut with great accuracy and speed, if they are operated at a sufficiently high rom speed. They should be operated at not less than 20,000 rpm for really good results. Available either singly or in full sets, these cutters are making good.

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#### SHEARING

So many are the shearing problems met with, in various parts of the metal-working industries, that many different kinds of shears must inevitably be used, to handle different kinds of work to advantage. Shears used in bench work are not at all unimportant, regardless of the fact that they are very small as compared with many shearing machines. Lever-operated bench shears of different kinds are in use in different plants, which readily cut 12-gage material. One bench

shear has jaws that resemble those of tin snips, but it incorporates a compound lever system, that gives the jaws the necessary power to cut material of thickness the mentioned. Other shears, made by the same company, have a base which may be securely bolted to the bench.

Heavy plate shears in use in various places have tremendous capacity, and are obtainable from different man-ufacturers. One One machine observed will handle plates six feet in width and 1¼" thick. This is really a large bite, and indicative of advances made in this di-rection. Progress on the other side of the shearing picture takes into account highly efficient portable electric shears, that have rather recently been developed. Some of these little shears have a motor that the motor housing actually forms a handle, that can be com-

fortably held in the hand, though the shear will cut material ranging up to No. 18-gage sheet steel. A larger portable electric shear, made by the same firm, will cut up to 16-gage sheet steel. It is fitted with an auxiliary handle. Shears of portable electric type are noted for the ease and facility with which they cut curved and irregular lines.

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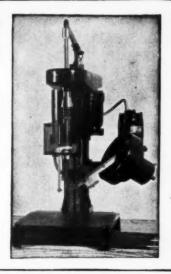
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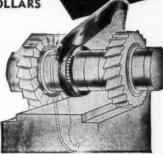
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| SIZE   | LENGTH<br>OVERALL<br>INCHES | FLUTES<br>INCHES | PRICE<br>EACH<br>NET | SIZE    | LENGTH<br>OVERALL<br>INCHES | LENGTH<br>FLUTES<br>INCHES | PRICE<br>EACH<br>NET |
|--------|-----------------------------|------------------|----------------------|---------|-----------------------------|----------------------------|----------------------|
| INCHES | INCHES                      | 12               | \$6.50               | 27/32"  | 15                          | 12                         | \$11.50              |
| 17/32  | 13                          | 12               |                      |         | 13                          | 12                         |                      |
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| 23/32" | 15                          | 12               | 8.50                 | 1-1/16" | 20                          | 15                         | 17.00                |
| 3/4"   | 15                          | 12               | 8.50                 | 1-1/8"  | 20                          | 15                         | 18.00                |
| 25/32" | 15                          | 12               | 9.50                 | 1-3/16" | 20                          | 15                         | 20.00                |
| 13/16" | 15                          | 12               | 11.00                | 1-1/4"  | 20                          | 15                         | 22.00                |

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motor models.

The Model LT-35 weighs only 2800 pounds but will lift, carry and stack a 1500 or a 2000 pound load in areas previously inaccessible to lift truck operation such as tight aisleways, elevators and the crowded confines of highway trucks and freight cars. Its comparatively light weight also makes operation possible on 2-ton capacity elevators and in multistory buildings with low to medium load

limits.

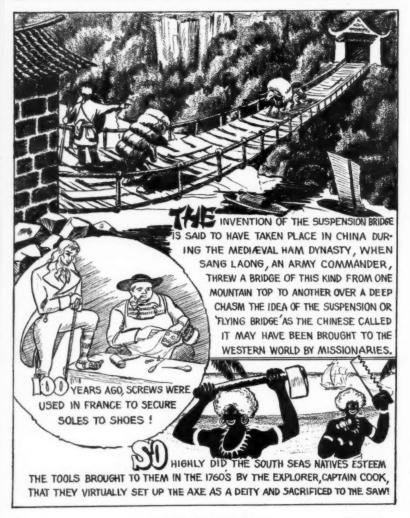
Unique design of the new model places the operator at the side of the power unit and makes it easy for him to get on and off. The seat has a comfortable back rest and is fully protected front and rear; while entrance to the driver's compartment is wide with the step only 9½ inches high. Two wheels on the steering axle



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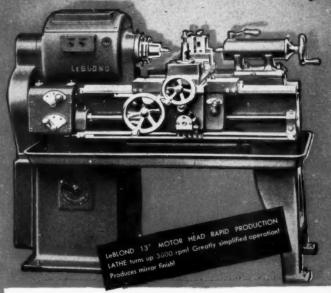
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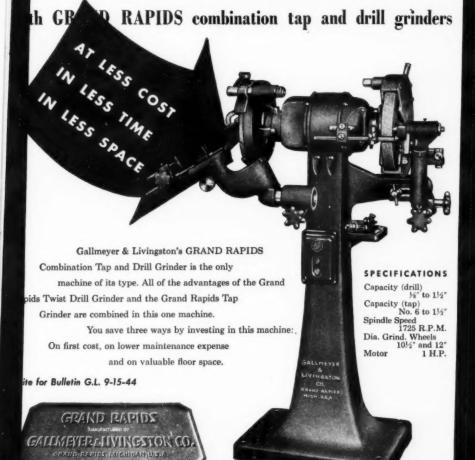
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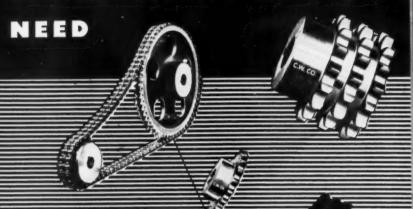
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